Pacific Advanced Civil Engineering, Inc., "Newhall Ranch Resource Management & Development Plan: River & Tributaries Drainage Analysis, Santa Clara River" (December 2008; 2008A)

Newhall Ranch Resource Management & Development Plan
River & Tributaries Drainage Analysis
Santa Clara River

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Table of Contents

List of Figures

List of Tables

1 Introduction

1.1 General Background

The following technical investigation provides a detailed and focused evaluation of the hydrologic and hydraulic impacts from the proposed Newhall Ranch development over a portion of the Santa Clara River watershed and floodplain. Santa Clara River is the main river of the Santa Clara River watershed encompassing a 644 square miles area with headwaters that extend in Ventura County. However, only 12.4 square miles of the Santa Clara River watershed are within the Newhall Ranch boundary that would impact the hydraulics of the canyon floodplain from the proposed future development. The existing floodplain generally consists of a natural alluvial River system that extends upstream approximately 4,800 feet from the canyon mouth at the Santa Clara River to the Newhall Ranch boundary. Adjacent development along the canyon within the Newhall Ranch will potentially modify the hydrologic response of the watershed through changes in the runoff and reduction in the sediment supply from the developed areas. Several alternative flood protection systems have been formulated as part of the adjacent development along the River system that involve different hydraulic elements which include: (1) bank protection or buried revetment, (2) excavation or grading of a modified channel system, (3) channelization, (4) invert grade control or grade stabilization of the streambed, (5) bridge crossings or culvert modifications, and (6) modification of the streambed profile and floodplain geometry. The proposed flood control systems are intended to provide long-term erosion protection from lateral migration of the stream bank and flood protection for the adjacent proposed development areas. These modifications to the stream system may result in adjustment to the hydraulic operation of the floodplain and changes to the stream mechanics. The intent of this analysis is to evaluate these impacts from both the (1) hydrologic modifications of the watershed from single hypothetical storm events, and (2) changes in the floodplain hydraulic operation.

In addition to evaluating the hydrological impacts of the Newhall Ranch Specific Plan, another objective of the analysis was to determine if predicted Project improvements (*i.e.*, "floodplain modifications") would cause significant impacts to the nature, amount and location of the aquatic/riparian habitats in the River corridor, the Specific Plan site, and the downstream reaches in Ventura County. The floodplain modifications included three bridge crossings over the River, buried soil cement bank protection placement along portions of the banks in the River corridor of the Specific Plan, and removal of mostly agricultural acreage from the floodplain by raising the land areas and installing elevated bank protection. The prior analysis, referenced above, evaluated impacts on flows, floodplain and habitat areas, velocities, water depths, and sediment scouring/deposition patterns for a range of storm flows within the River (2-year through 100-year flood and Q_{CAP} flows). The prior analysis determined that the proposed Specific Plan improvements would alter velocities in the River. However, the impacts were only expected during infrequent flood events (*e.g.*, 50-year, 100-year and Q_{CAP} flood events), and those impacts were only anticipated to reach the buried banks. The prior analysis (Section 2.3) also found that the Specific Plan would cause an increase in water velocities, water depth, changes in sediment transport, and changes in the flooded areas. However, these hydraulic effects were found to be minor in magnitude and event. These effects were also found to be insufficient to alter the amount, location and nature of aquatic and riparian habitats in the Specific Plan area and downstream in Ventura County. The prior analysis (Section 2.3) further determined that, under the Specific Plan, the River would still retain sufficient width to allow natural fluvial processes to continue. As a result, the prior analysis (Section 2.3) concluded that the mosaic of habitats in the River that support various sensitive species would be maintained, and the population of the species within and adjacent to the River corridor would not be significantly affected.

1.2 Study Objectives

The primary objective of this report is to develop the technical engineering analysis to assess and quantitative the impacts on the floodplain hydraulics from the proposed Newhall Ranch development for several alternative flood and erosion protection concepts. The intent is to provide a comprehensive assessment of alternative channel systems and the effects to the hydraulic operation based on the initial level of information available. This report provides preliminary technical analysis for (1) watershed mapping and characterization, (2) regional hydrologic modeling, (3) floodplain hydraulics and mapping, (4) characterization of representative hydraulic parameters, (5) preliminary engineering grading design and profiles of the flood control channel systems,(6) two dimensional mapping of the horizontal velocity distribution within the floodplain, and (7) initial assessment of stream stability through sediment transport capacities. The objectives of the floodplain and watershed assessment for the proposed development project include the following:

1. Quantify the hydrologic parameters that are representative of the watershed characteristics.
2. Determine the runoff from the watershed for both the existing and proposed land use conditions associated with different storm return periods
3. Hydraulic models of the existing floodplain and proposed flood control alternatives
4. Provide floodplain impact assessment through quantifying changes in the various hydraulic parameters.
5. Preliminary assessment of the streambed stability through determination of the sediment transport capacities within different reaches of the floodplain.
6. Quantitative floodplain mapping to assess changes in floodplain area and horizontal distribution of velocity within the floodplain

A variety of engineering analysis and tasks were associated with both the different aspects of the watershed hydrology and floodplain hydraulics. A technical framework was developed to guide the analysis of the system. These major task areas of study reflected the various objectives of the study and included the following:

1. Watershed delineation and parameter estimation – Determine regional watershed limits and interior sub-basin delineations based on surface drainage patterns. Utilize watershed mapping data to determine characteristic hydrologic parameters representative of loss rates, area, geometry, and runoff timing functions.
2. Watershed hydrology modeling – Application of synthetic runoff procedures to determine effective runoff from the watershed for the "existing" and proposed Ranch "development." Develop synthetic rainfall-runoff models to evaluate the watershed response
3. Floodplain field investigations – Perform field reconnaissance of the existing watershed conditions as well as ground photo survey along the entire existing River system within the Newhall Ranch boundary.
4. Baseline digital floodplain cross-section geometry – Layout appropriate spacing and location of cross-sections to establish the representative channel geometry. Digitally develop extremely accurate cross-section coordinate points using topographic digital terrain models (DTM) and CAD subroutines suitable for hydraulic model format. Adjust cross-section data to include horizontal variation of roughness and other attributes.
5. Baseline HEC-RAS hydraulic model – Prepare floodplain model in HEC-RAS based on the digital geometry and existing condition flowrates. Evaluation based on single storm event and steady flow conditions
6. Digital floodplain boundary BOSS-RMS – Detailed water surface profile analysis using BOSS-RMS to delineate the digital floodplain boundary.
7. Velocity distribution modeling – Determine the horizontal velocity distribution for each cross-section within HEC-RAS and determine the coordinate points for mapping purposes.
8. Velocity distribution mapping – Prepare the velocity distribution coordinates points in a format suitable for importing into CAD/GIS mapping software and utilize contour generating program to

develop contours of equal velocity. Manually adjust computer mapping of velocity distribution to interpret unusual conditions and incorrect interpolations generated by the computer.

9. Proposed channel system design profiles – Preliminary profile of the streambed invert for the proposed channel system alternatives. Preliminary profile based on conceptual assessment of maintain sediment transport continuity within each channel reach and adjusting the streambed slope until equilibrium is reached

10. Proposed channel digital grading design – Prepare digital engineering grading design for each of the channel system alternatives utilizing the bank protection layout and the preliminary profile as the guideline. The digital grading plan is required in order to prepare DTM of each proposed condition so that a digital floodplain boundary can be created as part of the velocity distribution analysis.

11. Proposed channel floodplain models and velocity distributions – Develop digital cross-section geometric data in BOSS-RMS for input into HEC-RAS. Review and refine the floodplain models to address hydraulic calculation issues.

12. Floodplain reach characterization and parameter estimation – Prepare an assessment of the hydraulic parameters and evaluate the statistics. Develop the velocity distribution mapping for each of the proposed conditions which includes determining the coordinates for each cross-section the velocity distribution, creating input format of data points into CAD/GIS, contour generation, and manipulation of the contours to address computer interpolations and incorrect assessments.

13. Sediment transport capacity analysis – Prepare steady state sediment transport capacity analysis through dividing the channel system into different reaches and comparing the capacity within each reach. The analysis involves determining the average hydraulic properties for each reach and then applying the appropriate sediment transport relationship to each grain size fraction.

14. GIS Mapping Floodplain Mapping and Parameter Statistics – Develop GIS mapping of all the floodplain mapping including the floodplain boundaries and velocity distribution so that the statistics can be accurately quantified as part of the impact assessment.

1.2.1 Soil Cement

The Project would include buried soil cement along the River up to a total of approximately 29,000 linear feet (LF) of River and River bank. The bank stabilization proposed is necessary to mitigate impacts associated with the Newhall projects. Most of the proposed bank protection would consist of buried soil cement to provide scour and freeboard flood control protection. The critical factors in determining the design of the bank protection were based on several factors including: (1) flood control stability and durability of bank protection; (2) bank protection maintenance considerations; (3) environmental compatibility with the native area, resource enhancement concepts, and aesthetic considerations; and (4) prior success in construction and cost of construction. Soil cement bank protection provides a stable riverbank protection material, in terms of both surface erosion and structural stability. Additionally, soil cement bank protection will be mostly buried. The exposed top portion of the soil cement will be aesthetically compatible with the native earth re-vegetated resource area. A typical soil cement cross-section is shown in Figure 3.1.

Soil cement is a highly compacted mixture of soil, cement, and water. As the cement hydrates, it hardens into a strong, durable, low-permeability material. Among the benefits to soil cement is that it may provide a more pleasant visual appearance, similar to that of a natural arroyo, as opposed to the visual harshness of traditional riprap. Construction projects like the proposed Project, generally utilize an on-site central batch plant whereby material can be directly excavated from the channel. Excavated material is then transported to a plug mill to separate the native material, if required, and then proceed by conveyor to a batch plant. The overriding benefit to a batch plant operation is that it allows quality control of the design mix being generated through computer management. The percentage by weight for the cement content can range from eight to 12 percent, depending on native material clay content. High clay content increases the cement requirement. Soil cement mix from the batch plant has a water content of approximately 90% when ready for application. The soil cement mixture is applied in 6-9" sheets called lifts, equal in width to the spreading equipment, which is generally nine feet (trimmed to eight feet). A roller will then compact the soil cement after each lift is applied. Soil cement bank protection slopes can be constructed very steep, usually 1h:1v, which reduces the right-of-way requirements compared to other alternatives with milder side slopes. An additional benefit of the steep side slope is that it facilitates the replacement of native material behind the engineered embankment if it is ever overtopped, since it can stand like a gravity wall. Following the final lift application, the exposed channel face can be trimmed to generate a clean surface and remove any soil cement that was not compacted.

1.2.2 Turf Reinforcement Mat

Turf Reinforcement Mat (TRM) bank stability protection along the Newhall Ranch SR-126/River utility corridor would be provided by installing approximately 4,600 LF of TRMs along the north bank of the River from the western end of the Landmark Village Project to the easterly end of the previously approved Newhall Ranch Water Reclamation Plant (RS 22195 to 17785). Alternative 7 (avoidance condition) would have TRM extend just upstream of Long Canyon Bridge (up to section 23975). Figures 3.3a – 3.7a depict the locations where TRMs would be installed.

TRMs are designed to reinforce vegetation at the root and stem allowing vegetation to be used as erosion control in areas where flow conditions exceed the ability of natural vegetation to remain rooted. This includes applications with high slopes or stream banks where grouted riprap and concrete channels are aesthetically undesirable.

TRM products are constructed of two basic materials that perform different functions: (1) Permanent netting designed to provide permanent structure and strength to the vegetation at the root and stem level; and (2) Degradable natural and synthetic fiber netting that provides erosion control immediately after installation by holding seed and soil particles in place and trapping moisture on the soil surface. A combination of the two can be used provide erosion control, vegetation establishment and reinforcement at one location. TRMs are secured to the soil surface using a predetermined staple pattern and either wire soil staples or biodegradable stakes.

1.2.3 Bridges

Information listed describes general conditions for the bridges while variations of bridges may be described within the alternative conditions.

The Commerce Center Drive Bridge over the River is to be located at RS 36299, upstream of the Castaic Creek discharge to the River. The bridge's proposed span is approximately 1200 LF with eleven piers within the River along the span. Bridge abutments are approximately 100 LF of River length of reinforced concrete transitioning to soil cement on the both the north and south banks.

The Long Canyon Road Bridge over the River is to be located at RS 22895, approximately 500 feet upstream of the Long Canyon discharge to the River. The bridge's proposed span is approximately 980 LF with nine piers within the River along the span. Bridge abutments are approximately 100 LF of River length of reinforced concrete transitioning to soil cement on the both the north and south banks.

The Potrero Canyon Bridge over the River is to be located at RS 15500, approximately 400 feet upstream of the Potrero Canyon discharge to the River. The bridge's proposed span is approximately 1530 LF with fifteen piers within the River along the span. Bridge abutments are approximately 84 LF of River length of reinforced concrete transitioning to soil cement on the both the north and south banks. In alternatives 5 and 6 there is no south abutment.

2 Existing Watershed and Floodplain

2.1 Existing Watershed Description and Characteristics

The 664 square mile Santa Clara River watershed, which extends 34.6 miles upstream of the Newhall Ranch area at its eastern extent to the Pacific Ocean at its western terminus, contains Newhall Ranch. Approximately 12.4 square miles of Santa Clara River watershed area is located within the Newhall Ranch property boundary, with the majority being upstream or offsite. The River in the headwaters flows in a general west to east direction while the remaining lower portion of the River flows in a north to south direction, similar in alignment to Chiquito Canyon and joining the Santa Clara River floodplain valley. The shape of develops creates a dogleg type appearance. The overall watershed boundary develops a shape such that a larger portion of the drainage area is tributary in the mid portion watershed since the width of the watershed narrows in either the upstream and downstream tails of the watershed while the central portion of the watershed widens to approximately 6,800 feet in width. The shape of the watershed is important since that influences when runoff reaches the outlet. Although the watershed is relatively long, the large width in the central portion of the watershed will result in delivering more runoff in shorter amount of time, increasing the peak discharges observed at the outlet. The distance from the upper headwaters to the canyon mouth is approximately 40 miles with an average overall slope of 0.0058. The major natural main stem drainage course within the watershed has an average slope in the lower reaches of the watershed through the Newhall Ranch property of approximately 0.0058. The majority of the Santa Clara River watershed is characterized by both rugged and steeply developed foothills that have numerous smaller tributary canyons that dissect the watershed, connecting to the narrow alluvial valley associated with the main stem River. The majority of the watershed consists of the rugged foothill topography with the remainder being the narrow valley floor. The topography for the watershed varies from a maximum elevation of 6700 feet in the headwaters to a low elevation of 960 feet near the mouth of the canyon at the Santa Clara River valley. Generally, the soils in the watershed are characterized as silty clay loams from both the Castaic and Saugus formations. Also, the soils within the Santa Clara River watershed can be predominately classified as being in hydrologic soil group C (higher runoff potential) with exception of areas adjacent to the main stem River that are type A (lower runoff potential) and Type B in the lower reaches. The associated vegetative cover within the watershed varies, but primarily consists of native grasses, chaparral, scrub, oak, and sagebrush. There are no major flood control improvements or dams within the watershed, other than several road culvert/bridge crossings such as the SR 126, which would influence the watershed response to rainfall events. Detailed hydrologic modeling has been performed to evaluate the baseline existing watershed conditions and the results of the peak discharges are discussed in the Section on *Hydrology*.

Table 2-1 - Santa Clara River - Existing Watershed Characteristics

Total Drainage Area	644 acres
Length of Watershed	40 miles
Maximum Elevation Difference	5740 feet (227 feet within Newhall boundary)
Average Slope	0.0058
Physical Topography Description	Rugged Foothill
Primary Hydrologic Soil Group	C

2.2 Existing Floodplain Description and General Characteristics

The lower Santa Clara River extends approximately 40 miles upstream from the canyon mouth at the Santa Clara River valley to the Newhall Ranch boundary. The geomorphology of the active River reflects a more highly variable and sinuous alignment that reflects the influence of the physical and topographic features. There is also a much greater variation of the active channel geometry (i.e. width and depth) along this relatively short reach of channel. The active portion of the River is more deeply incised below the canyon valley floor. The floodplain is generally entirely contained within the active River banks and there is little overbank flow. The changes in River geometry and form may indicate influences from the upper watershed that affect the sediment delivery. The changes in channel geometry are also reflected in coincidental variations of the streambed slope. The slope variations are generally higher in the contractions of the channel geometry and flatter in the expansion areas, upstream and downstream. The average streambed slope of the channel indicated by the topographic data is approximately 0.0058. The average slopes ranges from 0.05 to 0.005. The upstream 4,000 feet or so has a less defined active channel and wider canyon floor that reflect depositional area as well as increased floodplain vegetation within this zone. No manmade structure influences the hydraulic operation of this area. Detailed hydraulic modeling of the existing floodplain was performed and indicated that approximately 34% of the reach within the Newhall boundary of the Santa Clara River floodplain was hydraulically “steep” (Froude numbers greater than a value of 1.0) while the remainder of the canyon, primarily the upper portion to the Newhall Ranch boundary was hydraulically a ”mild” channel. The hydraulics also indicated a several locations the influence of the contraction in the channel geometry which controlled the hydraulics upstream and downstream of these locations. A brief description of the hydraulic operation of this 40 mile length floodplain for Santa Clara River Canyon from the downstream canyon mouth to the upstream Newhall Ranch boundary includes the following: (1) the immediate downstream portion of floodplain near the canyon mouth to the Santa Clara River is associated with a more prismatic earthen section that connects to the SR 126 roadway crossing and velocities downstream of the bridge increase from its influence, (2) upstream of the bridge crossing the channel significantly widens in a large incised erosion feature that reduces the velocities, (3) continuing upstream into the canyon mouth the River geometry contract and the velocities accelerate in this area along with the streambed slopes being steeper, (4) continuing still through the canyon mouth feature the River passes through several additional contractions and large expansion zones which is also indicative of the riparian vegetation occurring in the expansion zones, (5) the velocities in the contractions can range from 5 - 26 fps while the expansion areas are more in the 6 - 10 fps range, (6) continuing through the mid portion of the canyon the channel is fairly incised with the velocities averaging about 12 fps and encountering some variation in the channel geometry. The hydraulic characteristics of the 100-year floodplain generated by the hydraulic modeling indicates that (1) the average depth is approximately 9 feet, ranging from 3.5 feet to a maximum of 17.75 feet, (2) the average velocity is approximately 12 fps, ranging form 4.6 fps to 26.4 fps, and the width of the floodplain water surface averages 1070 feet, ranging from 250 feet to 2300 feet consistent with the various channel constrictions. Higher velocities generally occur within the contracted and incised portions of the floodplain and lower velocities within expansion areas and flatter longitudinal streambed slopes. Along the fringes of the floodplain lower velocities occur while the higher velocities are in the deeper portions of a channel section.

2.3 Existing FEMA Flood Hazard Mapping

The Federal Emergency Management Agency (FEMA) has developed published Flood Insurance Rate Maps (FIRM) identifying flood hazards associated with a base flood that has a 1-percent annual return probability (100-year return period) of being equaled or exceeded in any given year. This mapping is available for selected Rivers and rivers in the County of Los Angeles since it is a participant in the National Flood Insurance Program (NFIP) that is administered by FEMA. Communities participating in the NFIP must adopt and enforce minimum floodplain management standards, including identification of flood hazards and flood risks. In addition, the published flood hazard information is available in Geographic Information System (GIS) format, which is referred to a Q3 data because of the 3 data types provided (100-year, 500-year, and floodway data). However, the level of accuracy of the floodplain mapping performed for the flood hazards studies does not provide accurate results of the floodplain boundaries because (1) the mapping was done at a regional level and does not include the study of smaller local effects and disturbances along the fringe of the floodplain, (2) the cross-section spacing used in the hydraulic model was generally performed at large intervals so it tends to miss changes along a highly variable River system, (3) many flood hazards studies involve using “approximate” methods and only provide preliminary estimates of the floodplain, (4) flood hazards studies use the “existing” 100-year flowrate at the time of the study which may change with development, (5) the accuracy of the topography used in the analysis may not be to the level which obtains all the local topographic variations along the floodplain fringe and the topography was generally performed at a regional mapping level.

Santa Clara River floodplain does have a published FEMA 100-year floodplain which extends from the downstream confluence with the Santa Clara River to just several hundred feet upstream beyond the Newhall Ranch property boundary. The original published mapping illustrated in the 1996 Q3 data was updated in a Letter of Map Revision (LOMR) prepared by Sikand Engineering Associates in 1998 based on more detailed floodplain hydraulic mapping and more accurate topographic information. The floodplain maps associated with the approved LOMR were digitized in order to obtain digital mapping information. The comparison of the original FEMA Q3 100-year floodplain data and the more recent existing LOMR 100-year floodplain are illustrated on Figures 2.2 and 2.3.

The County of Los Angeles has also published floodplain studies for different stream and river systems within the County, which includes Santa Clara River. The County has generated the "Capital" floodplain and floodway boundaries on published "ML" maps (Miscellaneous Maps) for approximately 26,000 feet of the River. The capital floodplain and floodway is illustrated on 43ML-23 to 43ML-27 which was generated in July 1985 and adopted by the County Board of Supervisors in August 1985. The capital flood flow used by the County of Los Angeles is different from the adopted FEMA 100-year flowrate because of the methodology and rainfall, which results in the capital flood generally being much larger than the FEMA flowrate. The capital flood flow identified in the 1985 ML maps indicated an upstream value of 139,200 cfs and downstream value of 168,000 cfs where the floodplain was analyzed with a Manning's roughness coefficient of n=0.06. Another important difference is that FEMA only published a 100-year floodplain boundary and did not develop a published floodway, which was only produced by the County mapping.

3 Channel System Alternatives

3.1 General Discussion

A series of alternative proposed improvements are considered to quantify and compare the extent to which impacts to the aquatic environment occur in each proposed alternative, and the extent to which those impacts can be avoided. These alternatives suggest different possibilities that may effectively meet the project purpose, although as the following evaluation demonstrates, not all alternatives are equally successful at minimizing impacts to aquatic systems and meeting the project purpose. Impacts will be considered from the standpoint of impacts to jurisdictional Waters of the United States and areas under the jurisdiction of California Department of Fish and Game.

Proposed channel improvements, defined below, include channel modifications channel bank lining and revetments, channel grading, adjustments to streambed and channel profile, and the placement of drop structures, grade stabilizers, and bridges. Not all improvements will necessarily be included in any alternative, and combinations of multiple facilities and channel modifications are considered cumulatively.

3.2 Definition of Types of Hydraulic Facilities or Channel Modifications

3.2.1 *Channel bank lining or revetment*

Channel bank lining and revetments are composed of set-back, buried soil cement bank protection, exposed grouted riprap, and gunite. Buried soil cement is placed to provide scour and freeboard flood control protection in locations susceptible to erosion. The critical factors in determining the design of the bank protection were based on several factors including: (1) flood control stability and durability of bank protection; (2) bank protection maintenance considerations; (3) environmental compatibility with the native area and resource enhancement concepts, and aesthetic considerations; and (4) prior success in construction and cost of construction. Soil cement provides a stable riverbank protection material, in terms of both surface erosion and structural stability. Additionally, soil cement bank protection will be mostly buried. The exposed top portion of the soil cement will be aesthetically compatible with the native earth re-vegetated resource area. Soil cement is a highly compacted mixture of soil, cement, and water. As the cement hydrates, it hardens into a strong, durable, low-permeability material. Among the benefits to soil cement is that it may provide a more pleasant visual appearance, similar to that of a natural arroyo, as opposed to the visual harshness of traditional riprap.

3.2.2 Outlets

Discharging into the channel and the downstream River confluence require additional protection. In these cases buried soil cement will transition to grouted riprap at the edges of the works, and finally gunite at the base of the works. Gunite is a trade name for dry gunned concrete, although it is commonly used to refer to spray applied concrete. That is, the concrete is pneumatically applied or sprayed in place using air pressure. The process is also referred to as a dry gunning. Application occurs as cement and sand are injected into an air stream conveying the mix to a nozzle. At the nozzle water is added so that there is total control of the water-cement ratio.

3.2.3 Bridges

Frequently as a part of infrastructure improvements or demands, channel crossings are built over channels. While bridges are not specifically hydraulic structures, the placement of piers or the encroachment of bridge abutments in a channel does directly alter channel hydraulics. In some circumstances it is possible to completely span a channel. In cases where channel stability, seismic factors and other considerations necessitate bridge encroachment into the channel, the hydraulic impacts of the bridge will be considered on the channel.

3.3 Description of Alternatives

Seven alternatives are proposed for the channel: Alternative 1 (Existing Alternative), Alternative (Project Alternative) and five alternatives, including Alternative 7 (Avoidance Alternative). Figure 3.8 shows a comparison of the floodplain acreages. Discussed in detail below are the linear feet of buried soil cement bank protection (soil cement), turf reinforcement bank protection (TRM), and bridges as proposed under the various alternatives.

3.3.1 Alternative No. 1 (Existing Condition)

The condition of the study area as it exists at the time of writing. This includes the Highway 126 Bridge crossing Castaic Creek, agricultural activities along both banks, culverts at Chiquito and Grande Creek confluences under Highway 126, and the upland drainage crossing the project site. The major tributary confluences with the River within the study area are Castaic, Chiquito, Grande, Lion, Long and Potrero Creeks. In this condition, no development related to the proposed project exists.

3.3.2 *Alternative No. 2 (Proposed Project)*

Does not include any grading or structures in the Santa Clara River channel except that which is associated with the placement of buried bank protection or the placement of bridges and their attendant features. Alternative 2 (Proposed Project) plan is shown in Figure 3.3a. Approximately 18,780 and 10,177 feet of bank protection feet of soil cement are placed on the north and south channel banks, respectively, and a typical cross-section with bank stabilization is shown in Figure 3.1. Three proposed bridges will exist in the Project Alternative. The upstream bridge, located at Commerce Center Drive is approximately 1106 feet long, 100 feet wide and has eleven 3-foot wide piers in the channel. The second bridge, located at the Long Canyon confluence with the River, is approximately 975 feet long, 100 feet wide and has nine 3-foot wide piers in the channel. The downstream bridge is located at the confluence with Potrero Creek and is approximately 1,530 feet long and 84 feet with 15 three-foot wide piers in the channel. Although bridge lengths may change per alternative, the width of each bridge remains the same. The placement of the soil cement along the Project site will convert less than 5 acres of the upland agricultural area back to river channel under the 100yr event. Turf reinforcement mats (TRMs) are placed along 4,600 ft of the north bank between the upstream end of the WRP and downstream end of bank protection at Landmark. This will remain the same for each proposed alternative except alternative 7.

3.3.3 Alternative No. 3 and 4

Are the same with respects to bank stabilization alignment along Santa Clara River. Differences between alternatives 3 and 4 only occur along the tributaries, therefore in this remainder of this report these alternatives will be analyzed together. Both alternatives have two bridges, one at Commerce Center Drive and Long Canyon. The size and design of the bridges are the same for both alternatives 3 and 4, as well as Alternative 2. The soil cement alignment is the same as Alternative 2 except at Potrero where no bridge is proposed. As a result, the southern abutment is removed completely and the northern abutment has become incorporated into the north-bank soil cement. Approximately 18,115 and 7,743 feet of bank protection soil cement are placed on the north and south channel banks, respectively. A plan view with bank stabilization is shown in Figure 3.4a.

3.3.4 *Alternative No. 5*

Condition has the same three bridges and soil cement alignment as proposed in Alternative 2 except at the Potrero confluence. The north bank abutment has been pulled back from the River to reduce jurisdictional impacts and the south bank abutment has been removed. The Potrero Bridge in this alternative is approximately 2,382 feet long with twelve 3-foot wide piers in the channel. Approximately 18,324 and 7,742 feet of bank protection soil cement are placed on the north and south channel banks, respectively. A plan view with bank stabilization is shown in Figure 3.5a.

3.3.5 *Alternative No. 6*

Does not include the Commerce Center Drive Bridge, however, the Long Bridge is as proposed as in Alternative 2. The Potrero Bridge is pulled back on the north bank further than in Alternative 5 and the south bank abutment has been removed. The soil cement bank protection has the same alignment as in

Alternative 2 except the south bank abutments at Commerce Center Drive and Potrero have been removed, and the north bank abutment at Potrero has been pulled back to avoid permanent impacts, as described above. The Potrero Bridge in this alternative is approximately 2,395 feet long with twelve 3-foot wide piers in the channel. The Long Canyon Bridge is approximately 968 feet long with nine 3-foot wide piers in the channel Approximately 18,238 and 7,149 feet of bank protection soil cement are placed on the north and south channel banks, respectively. A plan view with bank stabilization is shown in Figure 3.6a.

3.3.6 *Alternative No. 7 (Avoidance Alternative)*

Proposed bank stabilization locations were designed to avoid U.S. Army Corps of Engineers and California Department of Fish and Game jurisdictional areas and the canyon was left to its natural condition for this alternative. Since the bank stabilization locations were designed to avoid these jurisdictional areas and were far enough from the existing conditions floodplain boundaries, very few changes were made to the alternative 1 (existing condition) HEC-RAS model for this condition.

This alternative has no bridge at Commerce Center Drive or at Potrero, and the bridge at Long Canyon has been extended. Additionally, the bank stabilization for the western half of the Landmark project site has been pulled back from the existing conditions 100-year floodplain and California Department of Fish and Game jurisdictional limit to avoid permanent impacts. The Long Canyon Bridge is approximately 2,630 feet long with nine 3-foot wide piers in the channel. Approximately 16,794 feet and 8,089 feet of bank protection soil cement are placed on the north and south channel banks. A plan view with bank stabilization is shown in Figure 3.7a. The TRM for this alternative is approximately 6,500 feet as it is placed to section 23975 upstream of Potrero Bridge.

4 Watershed Hydrology

4.1 Hydrology Background and Methodology

4.1.1 Los Angeles County Criteria

The Flood Control Division of the Los Angeles County Department of Public Works (LACDPW) regulates storm runoff protection. The LACDPW issued a 1986 memorandum entitled, “Level of Flood Protection and Drainage Protection Standards” for development projects in Los Angeles County. The memorandum established Los Angeles County policy on levels of flood protection and requires that the following facilities be designed for the Capital Flood: all facilities not under State of California jurisdiction that intercept flood waters from natural drainage courses; all areas mapped as floodways; all facilities that are constructed to drain natural depressions or sumps; and all culverts under major and secondary highways. All facilities in developed areas that are not covered by the Capital Flood protection conditions must be designed for the Urban Flood, or runoff from a 25-year frequency design storm.

In addition to meeting this required level of flood protection, all development in the River watershed must meet standards adopted by the LACDPW for the River and its major tributaries. (*See*, County Sedimentation Manual, pp. 2-2 to 2-6) Further, properties adjacent to the River that include improvements along and across a segment of the River (including the Project) must meet the standards adopted in the Newhall Ranch Program EIR and Revised Additional Analysis, Volume VIII (May 2003).

4.1.2 Explanation of the County Capital Flood

In 1931, the Los Angeles County Flood Control District (LACFCD) (now, the Flood Control Division of the County’s Department of Public Works) began development of a comprehensive plan of flood control facilities to collect and convey flows from the mountainous canyons, the alluvial fans, and the urbanized coastal plain.

The major needs in designing the system were reduction of damage due to high canyon flows, conveyance of large volumes of water in a major storm, and ability to meet future flood control needs. The design of the flood protection system for the County is based on the Department of Public Works’ Capital Flood hydrology.

The Department’s Capital Flood (or Q_{CAP}) hydrology is based on a “design,” or theoretical storm event that is derived from 50-year frequency rainfall values and is patterned after actual major extra-tropical storms observed in the Los Angeles region. The 50-year frequency design storm is assumed to occur over a period of four days, with maximum rainfall occurring on the fourth day.

Analysis of recorded major storms reveals that, during the 24-hour period of maximum rainfall, rainfall intensity typically increases during the first 70 to 90 percent of the period and decreases in the remaining time. Furthermore, approximately 80 percent of the amount of the 24-hour rainfall occurs within the same 70 to 90 percent of the period. In developing the Q_{CAP}, the 50-year frequency design storm is assumed to fall on saturated soils. In converting rainfall to runoff, rainfall that is not lost due to the hydrologic processes of interception, evaporation, transpiration, depression storage, infiltration, or percolation is assumed to be surface runoff. The effect of snowfall or snowmelt on rainfall-runoff relationships is a consideration in only a very limited portion of the County (i.e., the higher elevations) where snowfall accumulates in winter.

Another assumption made in developing a Capital Flood design flowrate is that some natural portions of the watershed have been burned by fire. When a watershed burns, the soil infiltration rate decreases due to the loss of vegetation and physical changes in the soil. The County has run field infiltrometer tests to quantify the effect that burning has on the coefficient of runoff. The effect of burning the watershed can increase the design runoff rate from 10 percent to 20 percent.

The final factor in adjusting the Capital Flood design flowrate is referred to as a bulking factor. In the area where a watershed is burned, the runoff would carry with it a large layer of eroded topsoil. This sediment, along with the associated burned trees and brush, is referred to as debris. In order to account for these quantities of debris, the design flowrate is artificially increased using a prescribed bulking factor, which is a function of not only soil type, but also the steepness of the terrain and the size of the drainage basin. The bulking factors for larger drainage basins range from about 1.20 to 1.50 or from 20 percent to 50 percent over and above the burned flowrate.

In September 2003, LACDPW revised the hydrologic method that accounts for fire effects on runoff computations. In the previous practice, a completely burned watershed was assumed. The current policy was updated to employ a statistical approach that relates historical fire data and vegetation recovery rates to changes in runoff coefficient of soil. A fire factor (*FF*) has been developed to represent the effectively burned percentage of a given watershed. This factor is used to adjust runoff coefficients for Q_{CAP} hydrology. The *FF* adjusts the coefficient by indexing between an unburned and completely burned soil coefficient for a given soil. This method has yet to be officially adopted by the County.

In this report, the former capital discharge is used for analysis and comparison. In design stages, the updated 2003 capital discharge will be employed. Because the 2003 capital discharge is lower than the pre-2003 discharge rates, using the updated discharge values in the design phase will result in reduced calculated flood flows and a reduced calculated potential for flood-related impacts. Using the former capital discharge is more conservative in determining impacts, and any changes in design of bank protection resulting from utilizing the updated capital discharge will only reduce the top of bank protection elevation and toe of the bank protection depth. Using the more recent discharge rates will not have the potential to alter the location of the proposed bank improvements. Final design of bank protection will adhere to LACDPW Q_{CAP} design standards.

In summary, the County's Q_{CAP} is based on a theoretical four-day storm event occurring right after the watershed has been burned with the resulting flowrate being increased again by a bulking factor; thereby yielding a peak flowrate that is 32 to 80 percent higher than a 50-year storm over an unburned-unbulked drainage basin. The probability of the occurrence of all the theoretical assumptions identified in the County's Capital Flood is extremely small, and yields greater design flows than the Federal Insurance Administration's methodology for calculating the 100-year and 500-year floods. As a result, the County's methodology is more conservative than that of the Federal Emergency Management Agency.

5 Floodplain Hydraulics

5.1 Floodplain Hydraulic Analysis Procedures

Detailed water surface profile models were developed to analyze the hydraulics representative of the different channel systems generated in the alternative analysis for the project and establish the "baseline" floodplain for the natural river system. The hydraulic models provide an accurate estimate of the actual flow depths and variation of different hydraulic parameters for a specific flowrate or steady state conditions using basic hydraulic principles. These hydraulic models are very useful in assessing the changes within the floodplain, reflecting different sets of conditions that allow the impacts to be quantified. The procedures used in the development of the hydraulic models and adjusting the results into different formats more suitable for impact assessment. A specialized technique was developed to illustrate one of the more critical hydraulic characteristic parameters, velocity, in a two-dimension format, providing a map of the floodplain area that shows horizontal variations of velocity. The results allow quantifying the total area of different "iso-velocity" contours or areas of similar velocity for both the existing and developed alternative floodplain conditions. This two dimensional analysis and application of the conventional hydraulic parameters from the water surface profile models provide an accurate assessment of the floodplain hydraulic operation. Detailed calculated data for over 80 hydraulic parameters characteristic of each individual cross-section are available as output from the computations performed by the HEC-RAS model. The general procedures used in the hydraulic model formation and associated hydraulic analyses included the following tasks:

1. <u>Existing natural floodplain digital cross-section geometry</u> – Channel hydraulics are calculated at representative cross-section locations along the river system and these cross sections are described by their physical geometry using data point or coordinates. The cross-sections are located at regular interval spacing and were located digitally on the topographic mapping. CAD routines would determine the coordinates for the points along the cross-section and export the data in a HEC-2 format file. The HEC-2 format file was converted into a HEC-RAS file. The HEC-RAS was corrected to include the required lengths along the channel and overbanks, as well as locating the main channel bank station markers.

2. <u>Existing variable roughness values</u> – Horizontal variation of the roughness within the natural floodplain cross-section was estimated from field ground photos and from color aerial photographs of the floodplain. The distribution of roughness within the cross-section was input into the HEC-RAS model.

3. <u>Digital floodplain boundary determination</u> – The floodplain boundary was analyzed in BOSS-RMS, which can provide a digital floodplain boundary mapped in CAD. This particular element was important for the velocity distribution mapping process.

4. <u>Cross-section velocity distribution</u> – Each individual cross-section velocity distribution was computed within HEC-RAS and the data output.

5. <u>Velocity distribution coordinates</u> – The coordinates of the horizontal velocity variation within each cross-section was determined based on the individual velocity distribution plots within HEC-RAS. Each data point coordinate included an "x" and "y" value as well as magnitude of velocity.

6. <u>Import floodplain boundary and velocity distribution into CAD/GIS</u> – The coordinate files were imported in the CAD/GIS civil mapping package for Land Development Desktop, which can develop topographic contour maps from digital coordinates. The digital floodplain boundary was required to set a boundary for the topographic map generation and a zero velocity boundary.

7. <u>Velocity distribution map preparation</u> – The velocity distribution contour mapping was generated within the Land Development Desktop (LDD) GIS software, however, the data had to be manipulated for input.

8. Adjustment of mapping uncertainties – The results of the CAD generated map of velocity contours had to be inspected because the program would make many interpolations, which were not correct. These anomalies were adjusted manually through interpreting the original HEC-RAS output and the horizontal mapping information. These adjustments included modification of the digital floodplain boundary, which would sometimes create islands of water or cutoff small fringes in the floodplain.

9. Alternative channel system invert profile generation – Channel profiles were required to be developed for each proposed alternative channel system since there proposed channels would require stabilization and modification of the streambed slope. In some areas, the channel bank stabilization encroached or blocks the existing thalweg.

10. Alternative layout plan – Layouts were required of the plan view geometry for each alternative channel system and horizontal alignment of the bank stabilization systems.

11. Digital floodplain cross-section geometry –Digital cross-sections were obtained from a new layout of cross-sections on the DTM for the proposed channel systems where BOSS-RMS was used to develop the data points of the geometry for each cross-section similar to the existing conditions process.

12. Alternative channel HEC-RAS modeling and velocity distribution mapping – Digital floodplain boundaries were generated in BOSS-RMS and the velocity distribution mapping for the proposed condition was prepared similar to the existing conditions analysis.

5.2 HEC- RAS (River Analysis System) Hydraulic Model

The US Army Corps of Engineers (ACOE) HEC-RAS water surface profile model was used to analyze the existing natural River floodplain and proposed flood control improvements for variations in different hydraulic characteristic parameters. HEC-RAS is a rigid boundary hydraulic model that assumes the channel bed or invert does not fluctuate although all the floodplain systems considered are actually fluvial systems with moveable alluvial streambeds. A sediment transport analysis was performed to assess the sediment transport capacity of different reaches of the floodplain as an indicator or relative stream stability and is described in more detail in *Section 6 – Stream Stability and Floodplain Operation*. The HEC-RAS model is a comprehensive program that is intended for calculating water surface profile hydraulics for steady/unsteady and gradually varied flow in natural and manmade channels. It is the primary tool used in the industry to evaluate the hydraulics of floodplain and floodplain mapping studies. The steady flow component is the process used for the current study and is capable of modeling subcritical, supercritical, and mixed flowrate surface profile regimes. The basic computational procedure is based on the solution of the on dimensional energy equation. Energy losses are evaluated by friction and contraction / expansion. The momentum equation is utilized in situations where the water surface profile is rapidly varied. The effects of various obstructions such as bridges and structures within the floodplain may be considered in the computation. HEC-RAS and current mapping programs allow detailed cross-section geometry to be obtained directly from digital topographic mapping which enhances the level of accuracy in describing the floodplain characteristics.

5.3 Hydraulic Model Assumptions and Parameters

The following guidelines, input data sources, and assumptions were used to develop the various hydraulic analyses with the HEC-RAS model:

- Channel Cross-Section Data: The data describing the channel cross-section geometry was obtained digitally from digital terrain models of topographic data representing the natural existing River system or the proposed grading of the alternative channel systems. Cross-sections were digitally oriented on the electronic mapping by BOSS-RMS exporting the data to HEC data and the distances between cross-sections adjusted, channel bank marker stations determined, and the horizontal variation of the Manning's roughness coefficients determined. The "proposed conditions" channel systems required that digital grading designs be generated in CAD and then the cross-sections data obtained. The digital grading plan was also required so that a digital floodplain boundary could be generated as part of the velocity distribution mapping.

- Rigid Boundary Model: HEC-RAS is a rigid boundary hydraulic model which assumes that the channel does not move or erode, but will remain with a fixed geometry. However, the channel is an alluvial stream system which is subject to both vertical and horizontal variation of the channel geometry. This assumption of a fixed bed is sufficient to assess the changes in the hydraulic parameters for different channel conditions and comparison purposes of the hydraulic operation. This analysis allows the assumption of a fixed set of conditions between the various alternatives to assess the different hydraulic operation characteristics and the potential for variation of the streambed can be evaluated through sediment transport analysis.

- Cross-Section Interval Spacing: The cross-sections were oriented to the perpendicular to the anticipated direction of flow and were spaced approximately 200 to 300 feet apart. Shorter intervals were used when there were unusual variations in the geometry which should be included and would not be representative of averaging between the normally spaced sections.

- Channel Roughness: Proper selection of the manning roughness coefficient is one of the more critical and subjective elements describing the hydraulics. The selection of the appropriate Manning's roughness coefficient was performed based on (1) field observation and inspection of the existing floodplain conditions, (2) color aerial photographs, (3) field ground photographs of representative locations along the natural River corridor, (4) comparison to published guidelines for roughness selection based on similar ground photographs corresponding to representative cross-sections, and (5) calculation of the Manning's coefficient within the floodplain based on the application of Cowan's additive procedure (Chow, 1959) of five different parameters that include a base value, surface irregularities, variations in shape, obstructions, vegetation, and meandering. The Manning's roughness coefficient was varied horizontally within the cross-section based on vegetative patterns and density. The proposed channel systems assumed the same vegetation density and patterns so the similar Manning's roughness values were used at identical cross-section locations compared to the natural channel since the precise roughness in the future can not be accurately predicted. Manning's values used in this study are shown in Table 5.3.

- Flow Regime: The hydraulic analyses were performed in a "mixed flow" regime which allows both subcritical and supercritical flow conditions to occur. This would reflect the actual conditions that would naturally occur in the hydraulic system and allow a more accurate comparison of the baseline existing floodplain to alternative channel systems without being influenced by forcing a specific single hydraulic regime.

- Starting Water Surface Elevations: Starting water surface elevations are required as boundary conditions at both the upstream and downstream limits of the model since the hydraulics were being analyzed in a "mixed flow" regime. The initial upstream depth was based on a "normal depth" or slope-area method, utilizing the natural upstream slope of the existing streambed beyond the study limits. The corresponding maximum water surface at the junction of the Santa Clara River was used as the downstream boundary conditions, but this did not generally influence the upstream hydraulic since the culvert at the 126 freeway usually dominated the hydraulics.

- Study Limits: The hydraulic model extended approximately 500 feet upstream of the Newhall Ranch property boundary in order to evaluate hydraulic effects beyond the project boundary.

- Channel Invert Elevations: The vertical elevations of the streambed or minimum elevation within each cross-section reflected the profile for either the (1) existing natural streambed, or (2) proposed graded channel invert elevation. The proposed grading incorporated the installation of grade stabilization structures along the channel system and resulted in the flattening of the channel grade to compensate for the change in the channel geometry from the natural condition and reduced sediment supply from the adjacent development areas.

- Flowrates – Multi-Discharge Analysis: An evaluation of the hydraulic effects and characteristics from various flood frequencies or storm return periods was developed through a multi-discharge analysis of **six different discharges** reflecting return periods developed from the HEC-1 analysis of the 2- through 100-year and Q_{CAP} events. The "existing" condition flowrate was only used in the natural floodplain conditions model while the larger "developed" flowrates were used in the proposed project and all the alternative channel systems. The analysis was performed for "steady flow" conditions reflecting the maximum discharge or single point on the flood hydrograph. Variation of the flowrates occurred along the channel to reflect change in the total drainage area and the junction of smaller tributary streams. In addition, the floodplain models were run with previous estimates of the "capital flood" discharge to ensure that the proposed channel systems did not overtop since these values exceeded the 100-year discharge.

5.4 Channel Hydraulic Conditions Modeled

A variety of floodplain hydraulic models were developed using both HEC-RAS and HEC-RMS. The HEC-RMS model is a proprietary version of HEC-RAS published by Boss International and was specified used because of its capabilities of digitally mapping the floodplain boundary which HEC-RAS cannot provide. Five different floodplain models were developed reflecting the five different floodplain geometries which include (1) natural or existing baseline conditions, (2) avoidance alternative, (3) proposed project, (4) alternative No. 1, and (5) alternative No. 2. All of these alternatives were analyzed for the six different flowrates corresponding to the six different return periods.

5.4.1 Alternative No. 1 (Existing Condition)

The natural topography within the Santa Clara River was used to develop the floodplain boundaries for the 2-, 5-, 10-, 20-, 50-, 100-year and Q_{CAP} return periods for this condition. About 200 cross-sections were cut along the length of the reach, approximately 200 feet apart on average. The 100-year floodplain reaches an average bottom width of 404 feet which is consistent between the other alternatives as proposed grading only occurs at the banks. The 100-year floodplain reaches an average top width of about 1236 feet.

5.4.2 Alternative No. 2 (Proposed Project)

A trapezoidal channel design is proposed for much of the River. Bank stabilization is designed at various locations for both the north and south sides of the channel. Three bridges will be placed with deck widths ranging from approximately 84 to 100 feet. The average top width is decreased to 1092 feet for the 100-year event.

5.4.3 Alternative No. 3 and 4

The 100-year floodplain average top width is decreased, but only to approximately 1119 ft.

5.4.4 Alternative No. 5

Similar to the proposed project channel system, the 100-year floodplain average top width is decreased to approximately 1065 feet.

5.4.5 Alternative No. 6

Minor changes were made to the grading of the fifth alternative, resulting in the 100-year floodplain average top width of about 1079 feet.

5.4.6 Alternative No. 7 (Avoidance Condition)

Since the bank stabilization locations were designed to avoid these jurisdictional areas and were far enough from the existing conditions floodplain boundaries, very few changes were made to the alternative 1 (existing condition) HEC-RAS model for this condition. The 100-year floodplain reaches an average top width of about 1234 feet which is almost identical with the average top width of alternative 1 (existing condition).

5.5 River Existing Conditions

5.5.1 Drainage Areas and Watercourses

The Santa Clara River traverses the Newhall site, which is located within a contributing drainage of 644 square mile Santa Clara River watershed basin. Rainfall in the tributary area is an annual average of 17 inches and generally occurs in the winter months. Runoff flows to and through six contributing drainage areas on the site via sheet flows and natural concentrated flows.

5.5.2 Santa Clara River

The reach of the Santa Clara River adjacent to the Project site has intermittent surface flows created by larger storm events. Perennial flows are created by tertiary treated effluent discharges from two upstream water reclamation plants operated by the County Sanitation Districts of Los Angeles County, and by urban runoff. Natural flows in the River only occur in the winter due to storm runoff. The flows vary significantly from year-to-year. The flow line of the River is currently along the southerly bank.

The reach of the River within and adjacent to the Project site has multiple channels (braided). This kind of system is characterized by high sediment loads, high bank erodibility, and intense and intermittent runoff conditions. Combined with the relatively flat gradient of the River at this point (less than one percent), the River has a high potential to aggrade (deposit sediment) at low flow velocities.

Velocities and water surface elevations in the River vary from section-to-section based on various hydraulic and hydrologic parameters. In general, velocity and depth along the River will increase with higher discharge.

Table 5-1 - Existing River Flow Downstream of Castaic Creek

Recurrence Interval	Flow (Discharge) Rate (cfs)
2-Year[1]	2,527
5-Year[1]	8,232
10-Year[1]	14,942
20-Year[1]	24,157
50-Year[1]	41,141
100-Year[1]	58,207
Capital Flood[2,3]	163,000
Capital Flood[2]	140,776

[1]*Existing flows from United States Army Corps of Engineers, Santa Clara River Adopted Discharge Frequency Values. Adopted May 3, 1994 by the United States Army Corps of Engineers, the Ventura County Flood Control Department*

[2]*LADPW Published Capital Flood Design Flows*

[3] *Q_{CAP} used in the SPEIR*

5.6 Santa Clara River Hydraulics

The modeling prepared for the Project is consistent with that prepared for the Newhall Ranch Specific Plan. There exists consistency between the Specific Plan analysis and with the analysis of the proposed Project as the models are consistent specifically because the proposed improvements are similar. Discharges include the 0.5 (2-year), 0.2 (5-year), 0.1 (10-year), 0.05 (20-year), 0.02 (50-year), and 0.01 (100-year) annual probability return periods. The numerical modeling includes velocity distributions for just over 200 River cross-sections. Manning's roughness values for the model bed were taken from analysis of aerial photography of the Project site, and vary horizontally along each model cross-section. The alternative 2 (proposed) conditions analysis was conducted by modifying the alternative 1 (existing) conditions model such that bank protection, described below, was placed within the model as encroaching levees. The impacts of the bridge are not included as a part of the numerical modeling analysis, and are expected to be covered in final bridge design.

Alternatives models 3 to 6 for the River were created by modifying alternative 2 (proposed project) cross-section geometrics of the River to simulate the hydraulic effects of the proposed Project soil cement, erosion protection, including the Bridge abutments and piers. The encroachment due to the soil cement was conservatively approximated with levees in the hydraulic model (model levees set at equivalent elevation on slope of channel invert). The modeling of proposed Bridge spans, soil cement banks, pier spacing, and abutment locations are based on the LACDPW design divisions location, span and clearance plans which is consistent with the Newhall Ranch Revised Additional Analysis, Volume VIII (May 2003). For modeling and impact analysis consideration, these conservative bridge configurations would have the greatest impact on River hydraulics. It should be pointed out that the present analysis is based on the Project-specific design details, not assumptions from the previous Newhall Ranch Specific Plan evaluation.

Existing Santa Clara River discharge rates for the 2-, 5-, 10-, 20-, 50-, and 100-year storm events were obtained from a 1994 U.S. ACOE study entitled, Santa Clara River Adopted Discharge Frequency Values. This study is based upon a frequency analysis of stream flow data along the Santa Clara River and, therefore, approximates River flows from observed data. These values are presented in Table 5.2. It is important to note that these values include discharges from upstream tributaries and direct runoff from the watershed.

Recurrence intervals included in the analysis were obtained from the 1994 study; the seventh Los Angeles County Capital flood is referenced from the previously published LACDPW ML Maps 43-ML-24 and 43-ML-25. This published Q_{CAP} flowrate from LACDPW was recently revised downward. For comparison purposes, the Existing and Existing modified with Project conditions will be evaluated with previously published Q_{CAP}, but the final design of bank protection will utilize the newest values.

Table 5-2 - Santa Clara River Existing Conditions Discharge By Return Period (cfs)

Location	Station	2-year	5-year	10-year	20-year	50-year	100-year	Qcap
DS Commerce Center Drive	40825	1,720	5,240	9,490	15,600	27,500	40,300	115,111
At Castaic Cr. Confluence	36080	2,527	8,232	14,942	24,157	41,141	58,207	116,236
DS Chiquito Cr. Confluence	32265	2,558	8,333	15,126	24,453	41,646	58,922	140,776
At Grande Cyn. Cr. Confluence	22195	2,581	8,408	15,263	24,675	42,025	59,457	141,426
DS Protrero Cr. Confluence	15125	2,600	8,480	15,400	24,900	42,400	60,000	142,475

As stated previously, build-out condition parameters are not addressed in this report, because they were analyzed previously in the Newhall Ranch Specific Plan EIR, inclusive of the Revised Additional Analysis, and there have been no significant changes to the Specific Plan or its circumstances, which would warrant a reanalysis of the prior program-level assessment conducted for the entire Specific Plan area (which includes the Project site).

Table 5-3 - Hydraulic Roughness Coefficients

Vegetation/Land Use	Calculated Manning's Roughness Coefficient	Reference Manning's Coefficient (Chow 1959)
Sand with no vegetation	0.025	0.025-0.033
Sand with Sporadic Growth/Grass Pasture	0.035	0.03-0.05
Scattered Brush/Heavy Weeds/Light Brush and Trees	0.05	0.035-0.07
Dense trees	0.15	0.11-0.20

Three minor changes to the Project buried soil cement are addressed in this report. These changes include: (1) modifications to the tie-in at Chiquito Canyon River; (2) avoidance of jurisdictional areas near the proposed central park area in the Project site; and (3) a minor realignment of the soil cement both up- and downstream of the Long Canyon Road Bridge. All three of the bank position modifications are cases in which flood protection is pulled further back from the location (*i.e.*, farther away from the River) than analyzed in the Newhall Ranch Revised Additional Analysis, Volume VIII (May 2003).

5.7 Results of Floodplain Hydraulic Analysis

Selected results from the floodplain hydraulic analyses for each of the five different channel systems investigated are included in summary tables in the following sections. Additional information of other hydraulic parameters at each cross-section along the floodplain model is also contained in the models and was used to develop the information for the summary tables. The summary results have been provided in the following format to assist in characterizing the hydraulic operation of the floodplain which include: (1) summary table for select hydraulic parameters using channel length weighted values, (2) hydraulic characteristics at five representative cross-sections at different location along the channel, (3) plot of velocity variation along the channel profile for the five different conditions, (4) water surface profile plot of the existing floodplain, (5) velocity distribution mapping of the proposed channel systems and existing floodplain, and (6) statistics associated with the velocity mapping indicating the quantity of area for each velocity increment within the floodplain.

5.7.1 Definition of Representative Hydraulic Parameters

The following are general definitions of some of the commonly used hydraulic parameters that are useful in characterizing the hydraulic operation of a channel system and these parameters have been estimated for the assessment of the different floodplain conditions.

Maximum channel flow depth – The difference between the lowest point in the cross-section and the water surface elevation.

Friction slope – Value of the energy gradient and is a strong indicator of conveyance related through the Section Factor (Z).

Average velocity – This represents the flowrate divided by the total cross-section flow area. The average velocity of the cross-section does not indicate the variation of velocity that generally occurs between the main channel and the overbanks or in locations of higher or lower roughness values varying across the section.

Channel average velocity – The flowrate in the portion of the floodplain defined to be the main channel or excluding the right and left overbank areas. The flowrate in the main channel is divided by the

Flow area – The amount of area perpendicular to the direction of flow and within the cross-section that the water is flowing.

Top width – Distance from one side of the channel to the other at the edge of the floodplain.

Shear Stress – Hydraulic radius multiplied by the friction slope and unit weight of water where the hydraulic radius in the flow area divided by the depth.

Stream Power – Shear stress multiplied by the velocity. This parameter is the strongest indicator of erosion thresholds or sediment transport when compared to shear stress and velocity alone.

5.7.2 *Estimated Average Floodplain Hydraulic Parameters*

Table 5-4 - Summary of Channel Average Hydraulic Parameters

Condition	Return Interval (years)	Max. Flow Depth (ft)	Average Velocity (fps)	Friction Slope	Flow Area (sq. ft.)	Top Width (ft)	Total Shear (psf)
Alt.1 (Existing)	2	3.3	4.5	0.0053	774.2	404.2	0.7
Alt.1 (Existing)	5	5.1	5.8	0.0053	1585.2	520.3	1.2
Alt.1 (Existing)	10	6.5	6.6	0.0052	2423.6	614.0	1.5
Alt.1 (Existing)	20	8.0	6.9	0.0052	3658.7	887.0	1.6
Alt.1 (Existing)	50	9.8	7.5	0.0051	5581.5	1131.1	1.8
Alt.1 (Existing)	100	11.3	8.0	0.0051	7283.6	1236.1	2.1
Alt.1 (Existing)	Qcap	16.4	9.1	0.0046	14403.8	1480.2	3.0
Alt.2 (Project)	2	3.3	4.5	0.0053	774.1	403.9	0.7
Alt.2 (Project)	5	5.1	5.8	0.0053	1574.8	520.0	1.1
Alt.2 (Project)	10	6.5	6.7	0.0052	2414.1	610.2	1.5
Alt.2 (Project)	20	8.0	7.1	0.0052	3581.5	799.3	1.7
Alt.2 (Project)	50	10.2	7.4	0.0051	5668.2	985.2	2.1
Alt.2 (Project)	100	11.9	7.8	0.0051	7489.4	1093.4	2.4
Alt.2 (Project)	Qcap	17.2	9.4	0.0046	13826.1	1245.7	3.5
Alt.3 & Alt.4	2	3.3	4.5	0.0053	771.4	404.5	0.7
Alt.3 & Alt.4	5	5.1	5.9	0.0053	1574.9	520.6	1.1
Alt.3 & Alt.4	10	6.5	6.7	0.0052	2404.3	610.2	1.5
Alt.3 & Alt.4	20	7.9	7.1	0.0052	3550.3	805.9	1.7
Alt.3 & Alt.4	50	10.1	7.4	0.0052	5633.6	1006.1	2.1
Alt.3 & Alt.4	100	11.8	7.8	0.0052	7470.2	1114.4	2.4
Alt.3 & Alt.4	Qcap	17.1	9.4	0.0046	13894.6	1273.6	3.5
Alt.5	2	3.4	4.4	0.0053	777.7	406.7	0.7
Alt.5	5	5.1	5.8	0.0053	1583.5	524.3	1.1
Alt.5	10	6.5	6.7	0.0052	2419.0	614.1	1.5
Alt.5	20	8.0	7.1	0.0052	3563.2	790.3	1.7
Alt.5	50	10.2	7.3	0.0052	5690.4	995.8	2.0
Alt.5	100	11.7	8.0	0.0051	7280.9	1065.2	2.4
Alt.5	Qcap	17.2	9.4	0.0046	13799.2	1252.4	3.5
Alt.6	2	3.4	4.4	0.0053	778.1	406.2	0.7
Alt.6	5	5.1	5.8	0.0053	1585.9	524.9	1.1
Alt.6	10	6.5	6.6	0.0052	2428.9	618.6	1.5
Alt.6	20	8.0	7.1	0.0052	3570.3	793.0	1.7
Alt.6	50	10.2	7.4	0.0052	5666.5	992.7	2.1
Alt.6	100	11.8	7.9	0.0051	7327.5	1078.7	2.4
Alt.6	Qcap	17.1	9.4	0.0046	13747.4	1249.7	3.5
Alt.7 (Avoidance)	2	3.3	4.4	0.0054	776.8	405.2	0.7
Alt.7 (Avoidance)	5	5.1	5.8	0.0053	1590.5	520.7	1.2
Alt.7 (Avoidance)	10	6.5	6.6	0.0052	2425.6	612.9	1.5
Alt.7 (Avoidance)	20	8.0	6.9	0.0052	3624.3	875.1	1.6
Alt.7 (Avoidance)	50	9.9	7.5	0.0052	5519.5	1133.7	1.9
Alt.7 (Avoidance)	100	11.4	8.1	0.0051	7096.4	1233.9	2.2
Alt.7 (Avoidance)	Qcap	16.7	9.3	0.0046	13956.5	1473.7	3.2

Table 5-5A - 2-Year Reach-by-Reach Average Hydraulic Parameters

Alt No.	Reach	River Sta. to Sta.	Max Depth (ft)	Avg. Velocity (fps)	Friction Slope (ft/ft)	Area (sq.ft.)	Top Width (ft)	Total Shear (psf)
1	SRA3	40825-38925	2.7	3.0	0.0055	603.3	321.4	0.71
1	SRA4	38710-36240	2.4	2.7	0.0055	690.6	448.6	0.54
1	SRB1	36080-34090	2.7	3.4	0.0057	789.4	449.9	0.69
1	SRB2	33880-32605	2.6	3.1	0.0059	858.8	646.9	0.52
1	SRC1	32265-29385	3.1	3.5	0.0052	790.7	410.9	0.70
1	SRC2	29140-27155	2.8	3.6	0.0056	755.1	336.4	0.90
1	SRC3	26990-25000	2.6	4.2	0.0055	634.7	409.9	0.56
1	SRC4	24795-22415	2.7	4.8	0.0050	550.7	336.7	0.62
1	SRD1	22195-20070	2.6	4.6	0.0050	599.6	337.1	0.61
1	SRD2	19855-17785	2.3	4.5	0.0054	597.0	384.0	0.57
1	SRD3	17510-15335	2.3	5.4	0.0051	492.3	268.7	0.69
1	SRE1	15125-13190	2.2	4.5	0.0057	595.0	379.3	0.60
1	SRE2	13030-11180	1.7	4.0	0.0050	708.9	587.0	0.56
1	SRE3	11015-9025	2.2	4.1	0.0053	636.1	499.2	0.42
1	N/A	3080-1000	3.1	4.4	0.0050	652.2	360.9	0.77
2	SRA3	40825-38925	2.7	3.0	0.0055	603.3	321.4	0.71
2	SRA4	38710-36240	2.4	2.7	0.0056	689.5	447.6	0.55
2	SRB1	36080-34090	2.7	3.4	0.0057	789.4	449.9	0.69
2	SRB2	33880-32605	2.6	3.1	0.0059	858.8	646.9	0.52
2	SRC1	32265-29385	3.2	3.5	0.0051	804.7	413.2	0.70
2	SRC2	29140-27155	2.9	3.4	0.0058	770.9	338.7	1.02
2	SRC3	26990-25000	2.6	4.2	0.0055	634.9	410.1	0.56
2	SRC4	24795-22415	2.6	4.8	0.0049	550.5	337.8	0.61
2	SRD1	22195-20070	2.6	4.6	0.0050	599.6	337.1	0.61
2	SRD2	19855-17785	2.3	4.5	0.0054	596.9	384.0	0.57
2	SRD3	17510-15335	2.3	5.5	0.0050	487.8	259.2	0.71
2	SRE1	15125-13190	2.2	4.5	0.0057	595.0	379.3	0.60
2	SRE2	13030-11180	1.7	4.0	0.0050	708.9	587.0	0.56
2	SRE3	11015-9025	2.2	4.1	0.0053	636.1	499.2	0.42
2	N/A	3080-1000	3.1	4.4	0.0050	652.3	361.0	0.77

Table 5.5B - 5-Year Reach-by-Reach Average Hydraulic Parameters

Alt No.	Reach	River Sta. to Sta.	Max Depth (ft)	Avg. Velocity (fps)	Friction Slope (ft/ft)	Area (sq.ft.)	Top Width (ft)	Total Shear (psf)
1	SRA3	40825-38925	4.7	4.0	0.0055	1323.2	399.6	1.21
1	SRA4	38710-36240	4.2	3.5	0.0051	1621.8	607.1	0.80
1	SRB1	36080-34090	4.7	4.7	0.0062	1811.0	603.1	1.24
1	SRB2	33880-32605	4.1	4.5	0.0055	1874.0	684.4	0.99
1	SRC1	32265-29385	5.4	4.7	0.0046	1964.9	613.0	0.98
1	SRC2	29140-27155	5.3	5.3	0.0066	1611.3	373.0	2.00
1	SRC3	26990-25000	4.3	6.0	0.0053	1425.1	521.8	0.97
1	SRC4	24795-22415	4.5	7.0	0.0050	1210.2	385.6	1.08
1	SRD1	22195-20070	4.2	5.6	0.0053	1575.3	625.0	0.94
1	SRD2	19855-17785	4.3	5.9	0.0049	1449.7	457.9	1.05
1	SRD3	17510-15335	4.3	8.2	0.0054	1049.9	294.0	1.29
1	SRE1	15125-13190	3.7	5.9	0.0057	1442.2	622.7	0.82
1	SRE2	13030-11180	3.0	5.8	0.0051	1535.0	676.3	0.85
1	SRE3	11015-9025	3.6	6.1	0.0053	1392.7	629.0	0.76
1	N/A	3080-1000	5.6	5.7	0.0049	1691.7	504.0	1.44
2	SRA3	40825-38925	4.7	4.0	0.0055	1323.9	399.8	1.21
2	SRA4	38710-36240	4.2	3.5	0.0051	1620.6	605.9	0.80
2	SRB1	36080-34090	4.7	4.7	0.0062	1811.0	603.1	1.24
2	SRB2	33880-32605	4.1	4.5	0.0055	1874.0	684.4	0.99
2	SRC1	32265-29385	5.3	4.7	0.0045	1945.2	611.8	0.96
2	SRC2	29140-27155	5.3	5.3	0.0066	1595.5	374.6	1.96
2	SRC3	26990-25000	4.3	6.0	0.0053	1425.5	522.1	0.97
2	SRC4	24795-22415	4.4	7.0	0.0050	1214.4	393.0	1.06
2	SRD1	22195-20070	4.2	5.6	0.0053	1567.2	620.9	0.94
2	SRD2	19855-17785	4.3	5.9	0.0049	1456.7	458.6	1.05
2	SRD3	17510-15335	4.5	8.0	0.0048	1086.9	291.3	1.23
2	SRE1	15125-13190	3.7	5.9	0.0058	1452.1	623.2	0.83
2	SRE2	13030-11180	3.0	5.8	0.0051	1535.0	676.3	0.85
2	SRE3	11015-9025	3.6	6.1	0.0053	1392.6	628.9	0.76
2	N/A	3080-1000	5.6	5.7	0.0049	1692.0	504.8	1.44

Table 5.5C - 10-Year Reach-by-Reach Average Hydraulic Parameters

Alt No.	Reach	River Sta. to Sta.	Max Depth (ft)	Avg. Velocity (fps)	Friction Slope (ft/ft)	Area (sq.ft.)	Top Width (ft)	Total Shear (psf)
1	SRA3	40825-38925	6.5	4.2	0.0055	2291.2	606.9	1.40
1	SRA4	38710-36240	5.5	4.1	0.0049	2582.6	706.8	1.09
1	SRB1	36080-34090	6.1	5.6	0.0064	2741.8	696.3	1.67
1	SRB2	33880-32605	5.3	5.6	0.0053	2705.1	696.0	1.35
1	SRC1	32265-29385	7.8	5.0	0.0041	3774.1	770.7	1.20
1	SRC2	29140-27155	7.2	6.6	0.0073	2352.8	424.8	2.82
1	SRC3	26990-25000	5.6	7.4	0.0050	2097.6	536.6	1.40
1	SRC4	24795-22415	6.0	8.4	0.0051	1856.2	441.8	1.45
1	SRD1	22195-20070	5.4	6.8	0.0054	2354.9	736.4	1.17
1	SRD2	19855-17785	6.1	6.8	0.0043	2348.1	556.8	1.34
1	SRD3	17510-15335	6.0	9.8	0.0050	1624.1	359.9	1.64
1	SRE1	15125-13190	4.7	7.4	0.0058	2102.8	683.3	1.13
1	SRE2	13030-11180	4.1	6.8	0.0050	2362.4	801.9	1.02
1	SRE3	11015-9025	4.5	7.4	0.0053	2112.7	737.3	1.03
1	N/A	3080-1000	7.4	5.7	0.0049	2974.1	666.5	1.89
2	SRA3	40825-38925	6.5	4.2	0.0055	2291.1	606.6	1.40
2	SRA4	38710-36240	5.5	4.1	0.0049	2557.1	700.5	1.08
2	SRB1	36080-34090	6.1	5.6	0.0063	2749.3	686.5	1.66
2	SRB2	33880-32605	5.4	5.5	0.0055	2734.6	696.2	1.47
2	SRC1	32265-29385	7.7	5.1	0.0040	3709.0	772.0	1.18
2	SRC2	29140-27155	7.2	6.5	0.0073	2357.7	426.0	2.84
2	SRC3	26990-25000	5.6	7.4	0.0050	2095.9	532.5	1.41
2	SRC4	24795-22415	5.9	8.5	0.0052	1808.9	443.6	1.38
2	SRD1	22195-20070	5.4	6.8	0.0054	2336.7	709.6	1.18
2	SRD2	19855-17785	6.1	6.8	0.0043	2345.0	543.5	1.35
2	SRD3	17510-15335	6.3	9.5	0.0048	1678.8	341.5	1.58
2	SRE1	15125-13190	4.7	7.2	0.0058	2150.4	719.2	1.11
2	SRE2	13030-11180	4.1	6.8	0.0050	2362.7	801.9	1.02
2	SRE3	11015-9025	4.5	7.4	0.0053	2112.7	737.3	1.03
2	N/A	3080-1000	7.4	5.7	0.0049	3009.8	666.4	1.92

Table 5.5D - 20-Year Reach-by-Reach Average Hydraulic Parameters

Alt No.	Reach	River Sta. to Sta.	Max Depth (ft)	Avg. Velocity (fps)	Friction Slope (ft/ft)	Area (sq.ft.)	Top Width (ft)	Total Shear (psf)
1	SRA3	40825-38925	8.1	4.6	0.0056	3435.9	763.0	1.76
1	SRA4	38710-36240	7.0	4.6	0.0048	3766.0	800.2	1.37
1	SRB1	36080-34090	7.6	6.4	0.0065	3896.1	844.0	1.87
1	SRB2	33880-32605	6.9	6.3	0.0051	3941.7	848.3	1.69
1	SRC1	32265-29385	9.7	5.8	0.0038	5496.4	877.2	1.45
1	SRC2	29140-27155	9.1	7.9	0.0077	3162.4	445.0	3.75
1	SRC3	26990-25000	7.5	7.8	0.0047	3213.8	623.8	1.72
1	SRC4	24795-22415	7.4	8.1	0.0049	3079.4	1223.2	1.08
1	SRD1	22195-20070	6.6	7.6	0.0052	3335.4	960.3	1.33
1	SRD2	19855-17785	9.2	4.5	0.0034	5785.6	1435.9	0.93
1	SRD3	17510-15335	7.6	8.3	0.0060	3160.0	1147.1	1.66
1	SRE1	15125-13190	5.6	7.3	0.0057	3436.2	1414.6	0.89
1	SRE2	13030-11180	5.2	7.6	0.0047	3396.2	953.0	1.16
1	SRE3	11015-9025	5.5	8.3	0.0052	3047.7	975.6	1.13
1	N/A	3080-1000	9.2	6.3	0.0048	4407.3	800.4	1.99
2	SRA3	40825-38925	8.1	4.6	0.0056	3435.9	763.0	1.76
2	SRA4	38710-36240	7.0	4.6	0.0048	3734.0	784.6	1.37
2	SRB1	36080-34090	7.6	6.4	0.0065	3870.4	836.3	1.88
2	SRB2	33880-32605	6.9	6.3	0.0051	3941.7	848.3	1.69
2	SRC1	32265-29385	9.7	5.8	0.0038	5509.9	877.3	1.44
2	SRC2	29140-27155	9.2	7.8	0.0077	3215.4	449.0	3.81
2	SRC3	26990-25000	7.5	7.8	0.0046	3215.3	623.8	1.72
2	SRC4	24795-22415	7.4	9.7	0.0054	2559.5	547.2	1.62
2	SRD1	22195-20070	6.6	7.9	0.0054	3220.3	752.7	1.50
2	SRD2	19855-17785	8.6	5.7	0.0033	4586.2	1029.1	1.02
2	SRD3	17510-15335	8.4	7.5	0.0059	3687.4	1026.0	1.99
2	SRE1	15125-13190	5.8	7.1	0.0058	3578.4	1330.1	1.13
2	SRE2	13030-11180	5.3	7.4	0.0049	3540.8	1008.1	1.28
2	SRE3	11015-9025	5.5	8.3	0.0052	3046.7	973.7	1.13
2	N/A	3080-1000	9.2	6.3	0.0048	4407.3	800.4	1.99

Table 5.5E - 50-Year Reach-by-Reach Average Hydraulic Parameters

Alt No.	Reach	River Sta. to Sta.	Max Depth (ft)	Avg. Velocity (fps)	Friction Slope (ft/ft)	Area (sq.ft.)	Top Width (ft)	Total Shear (psf)
1	SRA3	40825-38925	9.8	5.6	0.0055	5007.4	1017.0	1.80
1	SRA4	38710-36240	9.0	5.5	0.0050	5405.7	821.4	2.19
1	SRB1	36080-34090	9.7	6.4	0.0066	6521.2	1282.7	2.20
1	SRB2	33880-32605	8.8	6.4	0.0048	6455.3	1308.8	1.73
1	SRC1	32265-29385	12.9	6.3	0.0029	8672.9	1122.0	1.66
1	SRC2	29140-27155	11.9	9.4	0.0086	4579.5	549.5	4.61
1	SRC3	26990-25000	9.5	8.1	0.0050	5304.0	1187.0	1.64
1	SRC4	24795-22415	8.8	7.9	0.0046	5329.0	1790.9	0.98
1	SRD1	22195-20070	7.9	9.0	0.0054	4786.5	1264.3	1.43
1	SRD2	19855-17785	11.2	4.9	0.0031	9083.0	1737.6	1.02
1	SRD3	17510-15335	9.5	8.3	0.0067	5260.8	1450.5	2.09
1	SRE1	15125-13190	7.1	7.5	0.0059	5746.0	1659.5	1.36
1	SRE2	13030-11180	7.0	8.3	0.0042	5268.3	1121.8	1.30
1	SRE3	11015-9025	6.9	9.5	0.0054	4527.8	1120.0	1.57
1	N/A	3080-1000	11.6	7.0	0.0047	6658.2	968.5	2.32
2	SRA3	40825-38925	9.8	5.6	0.0055	5007.4	1017.0	1.80
2	SRA4	38710-36240	9.1	5.5	0.0049	5389.9	806.6	2.17
2	SRB1	36080-34090	10.0	6.1	0.0066	6807.6	1296.4	2.40
2	SRB2	33880-32605	8.8	6.4	0.0048	6466.8	1308.9	1.73
2	SRC1	32265-29385	12.9	5.9	0.0030	9098.7	1167.9	1.95
2	SRC2	29140-27155	12.4	8.7	0.0078	4914.1	627.9	3.96
2	SRC3	26990-25000	11.7	5.8	0.0050	7310.8	1075.3	2.32
2	SRC4	24795-22415	9.8	10.1	0.0056	4213.9	733.3	2.13
2	SRD1	22195-20070	8.9	8.7	0.0052	4997.4	814.6	1.99
2	SRD2	19855-17785	10.9	6.1	0.0034	7157.2	1181.6	1.47
2	SRD3	17510-15335	10.4	7.8	0.0063	5659.3	1145.9	2.53
2	SRE1	15125-13190	7.5	7.3	0.0061	6100.5	1484.3	1.64
2	SRE2	13030-11180	7.3	7.8	0.0045	5669.0	1147.9	1.69
2	SRE3	11015-9025	7.2	8.9	0.0054	4850.6	1137.6	1.81
2	N/A	3080-1000	11.7	6.9	0.0048	6774.3	970.5	2.39

Table 5.5F - 100-Year Reach-by-Reach Average Hydraulic Parameters

Alt No.	Reach	River Sta. to Sta.	Max Depth (ft)	Avg. Velocity (fps)	Friction Slope (ft/ft)	Area (sq.ft.)	Top Width (ft)	Total Shear (psf)
1	SRA3	40825-38925	11.3	6.2	0.0054	6657.3	1164.0	2.05
1	SRA4	38710-36240	10.6	6.4	0.0050	6744.6	840.1	2.63
1	SRB1	36080-34090	11.2	6.9	0.0066	8427.2	1339.7	2.70
1	SRB2	33880-32605	10.3	6.7	0.0047	8777.0	1554.6	1.94
1	SRC1	32265-29385	14.9	6.3	0.0027	11522.8	1246.0	1.73
1	SRC2	29140-27155	13.9	10.6	0.0088	5730.1	613.4	5.22
1	SRC3	26990-25000	10.7	8.9	0.0054	6802.6	1364.1	2.09
1	SRC4	24795-22415	9.7	8.5	0.0045	7064.2	1901.5	1.06
1	SRD1	22195-20070	8.9	10.0	0.0055	6085.5	1395.1	1.65
1	SRD2	19855-17785	13.2	4.9	0.0028	12746.2	1873.7	1.13
1	SRD3	17510-15335	10.6	9.0	0.0073	6899.8	1591.5	2.61
1	SRE1	15125-13190	8.2	7.9	0.0058	7647.6	1728.0	1.66
1	SRE2	13030-11180	8.7	8.5	0.0041	7258.7	1197.9	1.73
1	SRE3	11015-9025	8.1	10.3	0.0053	6011.7	1280.4	1.85
1	N/A	3080-1000	13.5	7.7	0.0046	8495.0	1053.7	2.66
2	SRA3	40825-38925	11.4	6.0	0.0052	6860.7	1178.0	2.16
2	SRA4	38710-36240	10.8	6.3	0.0051	6840.0	829.9	2.63
2	SRB1	36080-34090	11.9	6.2	0.0065	9341.9	1351.8	2.99
2	SRB2	33880-32605	10.5	6.5	0.0047	9041.5	1574.9	1.96
2	SRC1	32265-29385	14.8	6.2	0.0029	11529.5	1281.3	1.88
2	SRC2	29140-27155	14.3	9.7	0.0079	6263.7	763.0	4.11
2	SRC3	26990-25000	13.4	6.6	0.0050	9106.3	1090.3	2.79
2	SRC4	24795-22415	11.5	10.9	0.0057	5527.1	802.7	2.54
2	SRD1	22195-20070	11.7	7.9	0.0054	7967.4	1256.3	2.39
2	SRD2	19855-17785	12.8	6.4	0.0034	9620.5	1292.5	1.87
2	SRD3	17510-15335	11.8	8.7	0.0066	7160.9	1183.6	3.15
2	SRE1	15125-13190	8.7	8.0	0.0060	7837.2	1556.8	2.00
2	SRE2	13030-11180	9.1	8.1	0.0042	7723.4	1207.2	1.91
2	SRE3	11015-9025	9.0	8.7	0.0052	7470.6	1314.2	2.09
2	N/A	3080-1000	13.6	7.6	0.0047	8722.3	1056.0	2.85

Table 5.5G – Q_{CAP} Reach-by-Reach Average Hydraulic Parameters

Alt No.	Reach	River Sta. to Sta.	Max Depth (ft)	Avg. Velocity (fps)	Friction Slope (ft/ft)	Area (sq.ft.)	Top Width (ft)	Total Shear (psf)
1	SRA3	40825-38925	17.5	7.6	0.0043	15328.1	1615.6	2.73
1	SRA4	38710-36240	16.7	9.9	0.0062	12071.0	956.9	4.96
1	SRB1	36080-34090	15.8	7.8	0.0069	14903.8	1428.9	4.49
1	SRB2	33880-32605	15.0	7.1	0.0031	17161.8	1819.4	2.12
1	SRC1	32265-29385	21.0	8.1	0.0025	20289.5	1605.3	2.11
1	SRC2	29140-27155	20.7	13.4	0.0087	11081.0	1086.3	5.50
1	SRC3	26990-25000	15.5	10.4	0.0066	13674.1	1554.3	4.24
1	SRC4	24795-22415	13.3	10.3	0.0039	14002.0	2034.5	1.64
1	SRD1	22195-20070	12.3	11.9	0.0050	12471.4	2046.6	2.01
1	SRD2	19855-17785	19.1	5.6	0.0025	25231.3	2206.3	1.66
1	SRD3	17510-15335	14.9	10.5	0.0074	14610.6	1849.9	4.11
1	SRE1	15125-13190	13.2	8.6	0.0055	16725.4	1858.2	3.13
1	SRE2	13030-11180	15.6	8.9	0.0031	16138.2	1427.4	2.16
1	SRE3	11015-9025	14.4	10.5	0.0046	15254.5	1450.7	3.48
1	N/A	3080-1000	19.8	9.9	0.0043	15652.4	1179.9	4.18
2	SRA3	40825-38925	17.5	7.6	0.0043	15329.3	1615.7	2.73
2	SRA4	38710-36240	16.9	9.8	0.0062	12080.2	943.8	4.89
2	SRB1	36080-34090	16.0	7.7	0.0069	15107.4	1421.6	4.63
2	SRB2	33880-32605	15.0	7.1	0.0031	17126.1	1804.2	2.12
2	SRC1	32265-29385	20.9	8.3	0.0026	19754.0	1341.2	2.36
2	SRC2	29140-27155	20.1	12.9	0.0075	11263.8	903.9	5.78
2	SRC3	26990-25000	19.5	9.0	0.0046	15919.5	1127.2	4.35
2	SRC4	24795-22415	16.6	14.8	0.0056	9740.2	847.0	4.02
2	SRD1	22195-20070	17.1	10.2	0.0061	14012.8	1472.0	4.70
2	SRD2	19855-17785	18.8	7.7	0.0032	18507.7	1557.7	2.76
2	SRD3	17510-15335	16.4	11.2	0.0069	13061.5	1300.8	4.87
2	SRE1	15125-13190	13.4	9.8	0.0056	15397.0	1640.8	3.39
2	SRE2	13030-11180	16.2	8.4	0.0035	17238.8	1459.8	2.74
2	SRE3	11015-9025	14.3	10.7	0.0046	14965.9	1420.9	3.47
2	N/A	3080-1000	19.6	10.2	0.0043	15388.4	1177.5	4.13

Table 5.6A - 2-Year Floodplain Velocity Distribution Statistics

Velocity Increment	Alt. No. 1 (Existing)	Alt. No. 2 (Project)		Alt. No. 3 & 4		Alt. No. 5		Alt. No. 6		Alt. No. 7 (Avoidance)	
(fps)	acres	acres	% diff	acres	% diff	acres	% diff	acres	% diff	acres	% diff
0-2	128.4	128.9	0.4%	128.7	0.2%	129.1	0.6%	129.5	0.9%	130.0	1.3%
3-4	150.3	150.2	-0.1%	150.5	0.1%	150.9	0.4%	150.6	0.2%	149.3	-0.7%
5-6	127.7	127.5	-0.2%	127.3	-0.3%	128.2	0.3%	127.6	-0.1%	128.0	0.2%
7-8	33.0	33.1	0.2%	33.4	1.1%	32.3	-2.1%	32.8	-0.5%	33.3	0.8%
9-10	5.6	5.7	0.9%	5.6	0.2%	5.6	-0.9%	5.6	-0.5%	5.5	-1.1%
11-12	1.5	1.3	-9.5%	1.3	-12.2%	1.4	-8.2%	1.4	-8.2%	1.3	-12.2%
13-15	0.3	0.3	3.7%	0.4	29.6%	0.3	11.1%	0.3	11.1%	0.3	0.0%
16-18	0.1	0.1	0.0%	0.1	0.0%	0.1	0.0%	0.1	0.0%	0.1	0.0%
19-21	0.0	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
22-24	0.0	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
25-27	0.0	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
28-30	0.0	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
31-39	0.0	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%

Table 5.6B - 5-Year Floodplain Velocity Distribution Statistics

Velocity Increment	Alt. No. 1 (Existing)	Alt. No. 2 (Project)		Alt. No. 3 & 4		Alt. No. 5		Alt. No. 6		Alt. No. 7 (Avoidance)	
(fps)	acres	acres	% diff	acres	% diff	acres	% diff	acres	% diff	acres	% diff
0-2	119.4	118.7	-0.6%	120.1	0.6%	119.3	-0.1%	120.7	1.1%	120.5	0.9%
3-4	155.4	154.6	-0.5%	155.3	-0.1%	155.6	0.1%	155.6	0.1%	156.1	0.5%
5-6	130.7	131.1	0.3%	130.6	-0.1%	130.9	0.1%	130.7	0.0%	129.7	-0.8%
7-8	128.2	128.1	-0.1%	127.5	-0.5%	127.5	-0.5%	128.2	0.0%	128.2	0.0%
9-10	49.2	48.7	-0.8%	49.2	0.0%	49.9	1.5%	48.5	-1.3%	49.2	0.1%
11-12	11.8	11.9	0.6%	12.4	5.1%	11.3	-4.1%	12.2	3.1%	12.0	1.5%
13-15	3.4	4.1	20.0%	3.6	6.8%	3.5	3.5%	3.5	3.8%	3.3	-2.6%
16-18	0.3	0.9	196.6%	0.3	0.0%	0.3	0.0%	0.3	0.0%	0.3	0.0%
19-21	0.0	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
22-24	0.0	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
25-27	0.0	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
28-30	0.0	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
31-39	0.0	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%

Table 5.6C - 10-Year Floodplain Velocity Distribution Statistics

Velocity Increment	Alt. No. 1 (Existing)	Alt. No. 2 (Project)		Alt. No. 3 & 4		Alt. No. 5		Alt. No. 6		Alt. No. 7 (Avoidance)	
(fps)	acres	acres	% diff	acres	% diff	acres	% diff	acres	% diff	acres	% diff
0-2	133.0	131.9	-0.8%	127.9	-3.8%	129.4	-2.7%	129.8	-2.5%	133.0	0.0%
3-4	173.3	172.9	-0.2%	173.1	-0.1%	172.6	-0.4%	173.3	0.0%	172.6	-0.4%
5-6	130.6	131.3	0.6%	129.2	-1.0%	128.2	-1.9%	128.7	-1.5%	130.0	-0.5%
7-8	136.0	131.9	-3.0%	134.9	-0.8%	134.5	-1.1%	135.7	-0.2%	135.2	-0.6%
9-10	99.8	100.8	1.0%	101.7	1.9%	101.7	1.9%	100.7	0.9%	100.5	0.7%
11-12	35.0	36.1	3.2%	35.7	2.1%	36.4	4.0%	35.0	0.1%	35.1	0.2%
13-15	9.9	9.8	-1.4%	10.1	1.9%	9.2	-7.1%	9.7	-2.3%	9.8	-0.9%
16-18	2.3	2.3	0.4%	2.2	-0.4%	2.2	-0.4%	2.2	-0.4%	2.2	-0.9%
19-21	0.2	0.3	8.3%	0.3	8.3%	0.3	8.3%	0.3	8.3%	0.2	0.0%
22-24	0.0	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
25-27	0.0	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
28-30	0.0	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
31-39	0.0	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%

Table 5.6D - 20-Year Floodplain Velocity Distribution Statistics

Velocity Increment	Alt. No. 1 (Existing)	Alt. No. 2 (Project)		Alt. No. 3 & 4		Alt. No. 5		Alt. No. 6		Alt. No. 7 (Avoidance)	
(fps)	acres	acres	% diff	acres	% diff	acres	% diff	acres	% diff	acres	% diff
0-2	210.8	181.9	-13.7%	187.1	-11.3%	181.3	-14.0%	184.6	-12.5%	227.7	8.0%
3-4	272.1	226.0	-16.9%	232.8	-14.5%	229.8	-15.5%	233.9	-14.0%	248.8	-8.6%
5-6	161.4	154.4	-4.3%	156.6	-3.0%	149.5	-7.4%	150.7	-6.6%	161.7	0.2%
7-8	134.8	133.1	-1.2%	133.9	-0.7%	131.8	-2.2%	132.9	-1.4%	136.6	1.3%
9-10	128.4	123.7	-3.7%	124.8	-2.8%	124.9	-2.7%	126.4	-1.6%	127.6	-0.6%
11-12	64.6	69.2	7.1%	68.6	6.2%	65.5	1.4%	64.7	0.1%	64.4	-0.3%
13-15	23.1	26.8	16.1%	26.4	14.1%	25.2	8.9%	24.6	6.5%	23.7	2.4%
16-18	2.4	2.6	5.8%	2.6	6.6%	2.5	5.0%	2.7	12.0%	2.4	-0.8%
19-21	1.0	0.8	-21.8%	0.8	-20.8%	0.8	-20.8%	0.8	-20.8%	1.0	0.0%
22-24	0.3	0.4	9.4%	0.3	0.0%	0.3	0.0%	0.3	0.0%	0.3	0.0%
25-27	0.0	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
28-30	0.0	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
31-39	0.0	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%

Table 5.6E - 50-Year Floodplain Velocity Distribution Statistics

Velocity Increment	Alt. No. 1 (Existing)	Alt. No. 2 (Project)		Alt. No. 3 & 4		Alt. No. 5		Alt. No. 6		Alt. No. 7 (Avoidance)	
(fps)	acres	acres	% diff	acres	% diff	acres	% diff	acres	% diff	acres	% diff
0-2	232.4	234.4	0.9%	233.0	0.3%	229.7	-1.1%	225.9	-2.8%	305.1	31.3%
3-4	339.1	283.9	-16.3%	293.4	-13.5%	293.0	-13.6%	296.2	-12.7%	309.6	-8.7%
5-6	253.3	182.9	-27.8%	187.7	-25.9%	190.6	-24.7%	190.6	-24.8%	212.7	-16.0%
7-8	155.7	157.2	1.0%	161.1	3.4%	159.9	2.7%	159.5	2.4%	155.3	-0.3%
9-10	136.4	144.6	6.0%	146.8	7.6%	146.0	7.0%	145.9	7.0%	140.3	2.8%
11-12	105.6	97.7	-7.4%	94.5	-10.5%	95.5	-9.5%	96.4	-8.6%	103.3	-2.1%
13-15	58.6	50.9	-13.1%	52.2	-10.9%	47.2	-19.4%	47.1	-19.6%	59.8	2.1%
16-18	10.6	8.9	-15.8%	9.2	-13.0%	7.5	-29.0%	8.8	-17.0%	10.6	0.2%
19-21	1.7	1.2	-26.8%	1.2	-28.6%	1.2	-28.6%	1.2	-27.4%	1.7	-1.2%
22-24	0.7	0.5	-32.4%	0.5	-29.6%	0.5	-29.6%	0.5	-29.6%	0.7	0.0%
25-27	0.2	0.2	-20.8%	0.2	-20.8%	0.2	-16.7%	0.2	-20.8%	0.2	0.0%
28-30	0.0	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
31-39	0.0	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%

Table 5.6F - 100-Year Floodplain Velocity Distribution Statistics

Velocity Increment	Alt. No. 1 (Existing)	Alt. No. 2 (Project)		Alt. No. 3 & 4		Alt. No. 5		Alt. No. 6		Alt. No. 7 (Avoidance)	
(fps)	acres	acres	% diff	acres	% diff	acres	% diff	acres	% diff	acres	% diff
0-2	324.6	199.3	-38.6%	200.2	-38.3%	166.7	-48.6%	176.7	-45.6%	259.6	-20.0%
3-4	302.3	311.1	2.9%	325.8	7.8%	309.1	2.2%	310.9	2.9%	327.8	8.5%
5-6	218.1	214.7	-1.5%	215.6	-1.1%	216.1	-0.9%	217.0	-0.5%	230.0	5.4%
7-8	173.8	169.3	-2.6%	173.8	0.0%	162.7	-6.4%	168.8	-2.9%	187.0	7.6%
9-10	132.6	163.0	23.0%	167.7	26.4%	160.7	21.2%	162.3	22.4%	145.3	9.6%
11-12	127.8	111.5	-12.8%	113.9	-10.9%	125.6	-1.8%	120.4	-5.8%	132.9	4.0%
13-15	94.0	71.0	-24.5%	72.0	-23.4%	79.0	-15.9%	79.0	-16.0%	95.8	1.9%
16-18	26.5	24.2	-8.7%	22.9	-13.6%	24.1	-8.8%	23.2	-12.4%	25.9	-2.2%
19-21	6.4	5.0	-22.6%	4.8	-25.4%	5.5	-14.0%	5.5	-15.0%	6.3	-2.0%
22-24	1.3	1.3	-1.6%	1.2	-4.7%	1.1	-16.5%	1.1	-16.5%	1.3	-0.8%
25-27	0.3	0.2	-30.8%	0.2	-26.9%	0.3	19.2%	0.3	19.2%	0.3	0.0%
28-30	0.0	0.0	0.0%	0.0	0.0%	0.1	0.0%	0.1	0.0%	0.0	0.0%
31-39	0.0	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%

Table 5.6G - Q_{CAP} Floodplain Velocity Distribution Statistics

Velocity Increment	Alt. No. 1 (Existing)	Alt. No. 2 (Project)		Alt. No. 3 & 4		Alt. No. 5		Alt. No. 6		Alt. No. 7 (Avoidance)	
(fps)	acres	acres	% diff	acres	% diff	acres	% diff	acres	% diff	acres	% diff
0-2	117.6	127.4	8.3%	109.7	-6.7%	116.2	-1.2%	116.6	-0.8%	221.1	88.0%
3-4	286.6	243.4	-15.1%	266.0	-7.2%	254.2	-11.3%	246.7	-13.9%	286.9	0.1%
5-6	304.8	266.7	-12.5%	274.3	-10.0%	273.4	-10.3%	276.4	-9.3%	295.5	-3.1%
7-8	247.5	197.6	-20.2%	201.1	-18.7%	199.1	-19.6%	200.3	-19.1%	213.3	-13.8%
9-10	211.5	137.4	-35.0%	141.9	-32.9%	140.4	-33.6%	138.9	-34.3%	169.1	-20.0%
11-12	199.1	131.0	-34.2%	141.6	-28.9%	129.1	-35.1%	129.0	-35.2%	158.1	-20.6%
13-15	173.2	192.2	11.0%	194.2	12.2%	194.1	12.1%	197.4	14.0%	197.4	14.0%
16-18	78.5	88.3	12.4%	87.1	10.9%	91.4	16.4%	93.4	19.0%	78.3	-0.2%
19-21	34.5	40.5	17.3%	39.8	15.4%	41.5	20.4%	42.1	22.1%	37.6	9.0%
22-24	14.1	17.9	27.3%	14.5	3.4%	15.4	9.6%	15.5	10.6%	14.0	-0.4%
25-27	4.3	4.8	11.4%	4.2	-2.3%	4.2	-1.6%	4.2	-2.8%	4.3	-0.2%
28-30	2.2	2.2	0.0%	2.2	0.0%	2.2	0.0%	2.2	0.0%	2.1	0.0%
31-39	1.1	0.7	0.0%	0.7	0.0%	0.8	0.0%	0.8	0.0%	1.1	0.0%

5.8 Discussion of General Floodplain Hydraulics Trends

5.7.1 Alternative No. 1 (Existing Condition)

Maximum flow depths range from 3.3 feet to 16.5 feet; average velocities range from 4.5 fps to 9.1 fps and total shear range from 0.2 psf to 3.0 psf, all for 2-year through Q_{CAP} return periods (refer to 5.1). The velocity range within the river is in the 1.8 fps to 19.6 fps range.

5.7.2 Alternative No. 2 (Proposed Project)

Changes in channel geometry and flowrates also change the trends from existing to the proposed project channel system. Maximum flow depths range from 3.3 feet to 17.2 feet; average velocities range from 4.5 fps to 9.4 fps and total shear range from 0.7 psf to 3.5 psf, all for 2-year through Q_{CAP} return periods (refer to 5.1). As the flowrates increase, the velocities in majority of the channel also increase. Increases and decreases on the order of 0.2 fps can be seen from existing to proposed condition through the Q_{CAP} return period, as the flow area is constricted or expanded within the proposed channel.

5.7.3 Alternative No. 3 & 4

The proposed channel is widened so resulting floodplain hydraulic trends vary from the proposed project channel system to the first alternative concept. Maximum flow depths range from 3.3 feet to 17.0 feet; average velocities range from 4.4 fps to 9.5 fps and total shear range from 0.7 psf to 3.5 psf, all for 2-year through Q_{CAP} return periods (refer to 5.1). In this condition, a majority of the channel experience velocities below 6 fps from 2- and 5-year return periods, below 7 fps from 10-year return period, and were more spread out through the higher return periods. Higher velocities are mostly experienced by the downstream portion of the channel. Lower velocities are seen in the beginning reach of the upstream portion of the channel. The higher and lower velocity trend is true for all proposed alternatives.

5.7.4 Alternative No. 5

With the widening of the proposed channel, floodplain hydraulic trends vary from the proposed project channel system to this alternative concept. Maximum flow depths range from 3.4 feet to 17.2 feet; average velocities range from 4.5 fps to 9.4 fps and total shear range from 0.3 psf to 3.5 psf, all for 2-year through Q_{CAP} return periods (refer to 5.1). In this condition, a majority of the channel experience velocities below 6 fps from 2- and 5-year return periods, below 7 fps from 10-year return period, and were more spread out through the higher return periods.

5.7.5 Alternative No. 6

A slight difference in channel geometry can be observed from the fifth alternative concept to this alternative concept. These differences cause slight changes in the floodplain hydraulic trends. Maximum flow depths range from 3.4 feet to 17.0 feet; average velocities range from 4.5 fps to 9.4 fps and total shear range from 0.7 psf to 3.5 psf, all for 2-year through Q_{CAP} return periods (refer to 5.1). A majority of the channel experience velocities below 6 fps from 2- and 5-year return periods, below 7 fps from 10-year return period, and were more spread out through the higher return periods. Similar to the fifth alternative concept, higher velocities are mostly experienced by the mid-station portion of the channel.

5.7.6 Alternative No. 7 (Avoidance Condition)

With minimal changes to the hydraulic model, the floodplain hydraulic trends for this condition are similar to alternative 1 (existing condition) trends. Maximum flow depths range from 3.3 feet to 16.7 feet; average velocities range from 4.4 feet per second (fps) to 9.3 fps and total shear range 0.7 pounds per square feet (psf) to 3.2 psf, all for 2-year through Q_{CAP} return periods (refer to 5.1).

6 Vegetation

6.1 Impacts on Habitat

Most of the areas being on the Project site consist of agricultural fields and, to a lesser extent, disturbed and upland habitat areas with limited riparian habitat. Figures 6.1a - g graphically compare the vegetation acres within various flood events for each condition and illustrates that a large percent of the total impact results from converting agricultural land to the Project condition. The figure shows that some vegetation types are more exposed to flooding in the Project condition while the largest decrease is in vegetation both by percent and acres is agriculture.

The impacts of the project's implementation on vegetation are discussed below. In summary, the Project includes the construction of approximately 29,000 LF of soil cement, which is necessary to protect the Project's residential and commercial development and the Long Canyon Road Bridge. In addition, approximately, 4,700 LF of TRMs would be installed downstream of the Project site along the utility corridor between Chiquito Canyon and Grande Canyon Rivers. The impacts of installing bank protection, bridge piers and abutments (Long Canyon Road Bridge) and erosion protection to vegetation along the River are analyzed in this section. This analysis focuses only on the Project's hydrologic and hydraulic impacts on the River.

6.2 Alteration of Existing Drainage Patterns

6.2.1 Santa Clara River

The River will be encroached upon with the placement of the buried soil cement, TRMs, bridge abutments and piers, storm drain outlets and energy dissipaters proposed by the Project. Project impacts are expected to include habitat removal and disturbance, erosion, increased sedimentation, and habitat modification as a result of changes to River velocity and water surface elevation. The Project does not impact discharge in the River because no discharge is diverted from or to the River as a result of the Project, and no drainage currently discharging to the River will be prevented from discharging to the River in the Project condition (Table 6.1). Therefore no impacts will occur as a result of discharge changes.

Table 6-1 - Project-Related Changes in Discharge below the Specific Plan Site

Location - Downstream of the Specific Plan Site Below RS 15125	Discharge for Different Return Periods (cfs)						
	2-year	5-year	10-year	20-year	50-year	100-year	Qcap
Existing Conditions	2,600	8,480	15,400	24,900	42,400	60,000	142,475
Proposed Conditions	2,600	8,480	15,400	24,900	42,400	60,000	142,475
Net Change	0	0	0	0	0	0	0

Impacts associated with erosion and sediment deposition and, therefore, streambed modification within the River are evaluated as a function of in-stream velocities, which are indicators for potential riverbed scouring. This is discussed in detail within Section 7. In summary, the total area of floodplain where discharge velocities would be over 4 fps during a 100-year storm would be decreased by 130.7 acres as a result of the alternative 2 (proposed Project) condition. The tables shown on Figures 6.1a - g provide a summary of floodplain acreage (by vegetation type) where Project-related increases or decreases in discharge velocities in excess of 4 fps would occur. The area of floodplain subject to flows in excess of 4 fps would be reduced by approximately 0.0, -0.6, 6.8, -46.1, 19.7, 130.7 and 135.7 acres as a result of alternative 2 (proposed Project) condition during the 2-, 5-, 10-, 20-, 50-, 100-year and Q_{CAP} events, respectively. Additionally, no impacts to velocity will be realized upstream or downstream of the Project. Existing and proposed conditions velocity and water surface elevation are compared in Table 6-2.

Table 6-2 – Existing and Proposed Water Surface Elevations for the 100yr Discharge

STATION	WSE PROP	WSE EXIS	DELTA	STATION	WSE PROP	WSE EXIS	DELTA	STATION	WSE PROP	WSE EXIS	DELTA
40825	1010.74	1010.73	0.0	27335	933.66	932.53	1.1	15125	863.46	863.07	0.4
40585	1009.57	1009.55	0.0	27155	933.15	931.32	1.8	14900	861.81	861.75	0.1
40335	1008.77	1008.74	0.0	26990	932.51	929.65	2.9	14720	860.72	860.51	0.2
40130	1007.99	1007.94	0.0	26780	930.59	929.04	1.6	14480	858.57	858.81	-0.2
39945	1007.09	1006.99	0.1	26575	930.12	928.66	1.5	14315	858.07	857.92	0.2
39755	1005.52	1005.23	0.3	26355	929.60	927.45	2.1	14090	857.41	856.49	0.9
39605	1004.59	1003.98	0.6	26170	928.69	926.16	2.5	13850	856.11	855.36	0.8
39310	1002.12	1001.75	0.4	25965	927.88	924.65	3.2	13635	855.16	854.63	0.5
39100	1001.26	1001.12	0.1	25785	927.20	923.37	3.8	13425	854.49	853.53	1.0
38925	1000.70	1000.52	0.2	25600	926.51	923.01	3.5	13190	852.91	852.23	0.7
38710	999.76	999.45	0.3	25425	925.57	922.20	3.4	13030	851.59	851.33	0.3
38475	998.07	997.30	0.8	25215	924.14	921.47	2.7	12835	850.79	850.31	0.5
38300	996.43	996.05	0.4	25000	922.85	920.55	2.3	12615	850.03	849.19	0.8
38065	994.83	994.83	0.0	24795	921.49	918.46	3.0	12395	848.86	848.17	0.7
37810	992.69	992.68	0.0	24550	919.24	916.58	2.7	12195	847.85	847.23	0.6
37655	991.20	991.16	0.0	24335	916.20	915.07	1.1	11995	846.33	845.92	0.4
37390	989.90	989.81	0.1	24115	914.53	913.42	1.1	11780	845.33	845.33	0.0
37135	988.97	988.83	0.1	23975	914.25	912.35	1.9	11605	844.23	844.23	0.0
36930	988.21	988.01	0.2	23755	913.30	911.56	1.7	11405	843.83	843.84	0.0
36735	987.67	987.42	0.3	23565	912.42	910.18	2.2	11180	842.72	842.72	0.0
36515	987.35	987.06	0.3	23365	911.30	908.77	2.5	11015	841.38	841.40	0.0
36374	987.14	986.87	0.3	23180	909.53	907.44	2.1	10835	838.94	838.90	0.0
36240	986.77	986.59	0.2	23000	909.13	907.23	1.9	10575	837.75	836.76	1.0
36080	985.75	985.60	0.1	22790	908.61	906.81	1.8	10390	836.67	836.11	0.6
35845	984.36	984.02	0.3	22600	907.27	906.38	0.9	10225	835.46	835.17	0.3
35725	983.55	982.96	0.6	22415	905.67	905.95	-0.3	10000	833.93	833.68	0.3
35515	982.50	981.20	1.3	22195	903.42	903.53	-0.1	9820	833.65	832.87	0.8
35245	980.39	979.46	0.9	22010	902.74	902.48	0.3	9595	833.28	831.57	1.7
35040	978.92	978.45	0.5	21790	902.61	901.57	1.0	9385	832.73	830.66	2.1
34860	978.30	977.65	0.6	21615	902.41	899.78	2.6	9220	831.98	830.13	1.9
34720	977.47	976.36	1.1	21440	901.98	898.45	3.5	9025	831.04	829.27	1.8
34495	975.20	974.30	0.9	21225	900.98	897.15	3.8	3080	829.71	828.82	0.9
34310	973.85	973.15	0.7	21020	899.89	896.32	3.6	3070	828.81	828.08	0.7
34090	972.45	971.89	0.6	20845	898.88	894.59	4.3	3060	827.61	826.96	0.6
33880	970.48	970.48	0.0	20595	897.80	893.77	4.0	3050	825.33	825.30	0.0
33710	968.73	968.67	0.1	20435	897.00	893.46	3.5	3040	822.98	822.92	0.1
33500	967.69	967.55	0.1	20280	895.48	891.86	3.6	3030	822.14	822.05	0.1
33310	966.80	966.53	0.3	20070	893.48	890.61	2.9	3020	816.10	816.65	-0.5
33115	966.19	965.78	0.4	19855	891.06	889.73	1.3	3010	810.72	809.70	1.0
32795	965.14	964.90	0.2	19630	890.15	889.31	0.8	3000	808.45	807.86	0.6
32605	964.32	964.32	0.0	19440	889.52	889.09	0.4	2090	805.98	805.98	0.0
32265	963.18	963.18	0.0	19240	888.39	888.83	-0.4	2080	802.76	802.76	0.0
31875	958.32	958.33	0.0	19050	887.73	888.62	-0.9	2070	796.41	796.41	0.0
31585	957.76	957.48	0.3	18830	886.71	888.16	-1.4	2060	793.89	793.89	0.0
31360	955.77	955.01	0.8	18650	886.41	887.69	-1.3	2050	791.92	791.92	0.0
31060	954.87	954.99	-0.1	18475	886.24	887.23	-1.0	2040	784.83	784.83	0.0
30720	954.45	954.77	-0.3	18290	885.73	886.68	-0.9	2030	781.96	781.96	0.0
30445	954.22	954.54	-0.3	18025	885.33	885.85	-0.5	2020	778.84	778.84	0.0
30095	953.94	954.28	-0.3	17785	884.99	885.01	0.0	2010	774.04	774.05	0.0
29815	953.49	953.83	-0.3	17510	882.40	882.39	0.0	2000	766.39	766.37	0.0
29565	953.09	953.43	-0.3	17360	879.21	879.22	0.0	1090	761.62	761.88	-0.3
29385	952.59	952.96	-0.4	17110	878.44	878.38	0.1	1080	756.70	755.63	1.1
29140	951.32	951.74	-0.4	16970	877.82	877.73	0.1	1070	754.19	753.65	0.5
28895	947.30	947.88	-0.6	16720	872.73	872.75	0.0	1060	752.91	752.85	0.1
28695	943.62	943.98	-0.4	16515	871.53	870.54	1.0	1050	751.77	751.69	0.1
28500	941.43	941.32	0.1	16305	871.23	869.62	1.6	1040	749.23	749.05	0.2
28280	940.41	940.07	0.3	16130	870.49	868.81	1.7	1030	744.76	743.44	1.3
28080	939.66	939.09	0.6	15960	870.14	867.73	2.4	1020	740.38	740.43	0.0
27925	938.66	938.04	0.6	15745	869.56	866.88	2.7	1010	736.85	738.06	-1.2
27725	935.24	934.95	0.3	15540	869.18	866.03	3.1	1000	730.81	730.81	0.0
27545	934.67	934.22	0.4	15335	867.55	864.19	3.4				

It is important to note that the existing discharges are employed in the following analysis because the proposed improvements do not alter the discharged runoff from the Project site.

The proposed reinforced concrete and riprap at bridge abutments, in addition to the soil cement, would encroach into the existing FEMA 100-year flood plain in some areas. During the 100-year storm approximately 123.8 acres of existing River channel would be encroached upon by the proposed improvements. These encroachments will trigger FEMA approval in the form of the Conditional Letter of Map Revision/Letter of Map Revision (CLOMR/LOMR) floodplain map revision process. Encroachment impacts were evaluated using floodplain and habitat engineering and analyzed on the basis of depth and velocity, as described below. Additionally, some banks located out of the floodplain need stabilization because of lateral migration of the River bed, as well as the need to protect for the Q_{CAP} discharge. Installation of the soil cement would have the potential to result in short-term construction-related disturbances of the ground surface as excavated areas on the River side of the soil cement would be filled and re-vegetated. Long-term impacts would have the potential to occur because soil cement used to stabilize the River's banks places a permanent feature in the existing floodplain.

In other areas, the soil cement would be placed outside the existing River channel, creating additional new River channel. For example, soil cement proposed on the north side of the River near the confluence with Castaic River would be constructed on agricultural land, north of the existing channel. The land located between the existing River bank and the newly created stabilized bank would be excavated to widen the existing channel, which would increase the area available within the channel and increase the capacity of the River to convey the passage of flood flows. Overall, 17.8 acres of River channel would be impacted/ removed by proposed soil cement, while 404.1 acres is preserved based on ACOE jurisdiction.

The Specific Plan acknowledges that natural riverine dynamics could erode fill placed on top of the hardened bank (buried soil cement) during certain flood events. For example, natural riverine migration between the banks may place the thalweg in contact with the bank. Additionally, storms greater than approximately the 25-year discharge are expected to flow from bank to bank. In high velocity conditions flowing water has the potential to erode soils covering buried soil cement. Specific maintenance activities would be subject to the federal and state permits needed to construct and maintain the necessary channel improvements. It is anticipated that these permits would allow for placement of fill on the buried soil cement when the soil is eroded during periods of high flows. It is important to note that bank erosion is only expected to occur when velocities at the banks exceed 4 fps. Velocities greater than 4 fps at channel centers are expected to erode channel beds but not channel banks.

The Commerce Center Drive Bridge is proposed to be constructed across the River at the eastern end of the Project site at STA 36299. The Bridge is to include abutments transitioning to soil cement, and approaches that would reduce the width of the 100-year floodplain. However, as summarized below the existing active River channel width allows certain flood events to be completely spanned by the bridges and remain unaffected. The 10- through 100-year and Q_{CAP} events would be impacted by the narrowing of the channel resulting from the implementation of the proposed improvements, although flooding up to and including the Q_{CAP} event would still be contained within channel.

Table 6.3.1 - Discharge Top Width and Water Surface Elevation at Commerce Drive Bridge

RETURN PERIOD (YEARS)	Q (CFS)	TOP WIDTH (FT)	WSE (FT)
2	1720	478	977
5	5240	617	980
10	9490	919	981
20	15600	1032	983
50	27500	1058	985
100	40300	1071	987
Qcap	115111	1099	992

The Long Canyon Road Bridge is proposed to be constructed across the River, near the western end of the Project site at STA 22895. The Bridge is to include abutments, riprap transitions to soil cement, and approaches that would reduce the width of the 100-year floodplain. However the existing active River channel width, which carries the 2- through 20-year flood events, would be completely spanned by the bridge and remain unaffected. The 50-, 100-year and Q_{CAP} events would be impacted by the narrowing of the channel resulting from the implementation of the proposed improvements, although flooding up to and including the Q_{CAP} event would still be contained within channel.

Table 6.3.2 - Discharge Top Width and Water Surface Elevation at Long Canyon Bridge

RETURN PERIOD (YEARS)	Q (CFS)	TOP WIDTH (FT)	WSE (FT)
2	2558	400	900
5	8333	428	902
10	15126	468	903
20	24453	517	905
50	41646	815	907
100	58922	832	909
Qcap	140776	887	915

The Potrero Canyon Road Bridge is proposed to be constructed across the River, near the western end of the Project site at STA 15500. The Bridge is to include abutments, riprap transitions to soil cement, and approaches that would reduce the width of the 100-year floodplain. However the existing active River channel width, which carries the 2- through 10-year flood events, would be completely spanned by the bridge and remain unaffected. The 20- through 100-year and Q_{CAP} events would be impacted by the narrowing of the channel resulting from the implementation of the proposed improvements, although flooding up to and including the Q_{CAP} event would still be contained within channel.

Table 6.3.3 - Discharge Top Width and Water Surface Elevation at Potrero Canyon Bridge

RETURN PERIOD (YEARS)	Q (CFS)	TOP WIDTH (FT)	WSE (FT)
2	2581	255	859
5	8408	329	862
10	15263	371	864
20	24675	1418	866
50	42025	1424	868
100	59457	1430	869
Qcap	141426	1449	874

Table 6.4 shows that during the 100-year storm event, Project-related improvements would result in 52 locations of increased water surface elevation exceeding one foot, and no decreased water surface elevation locations with one exceeding one foot, in the River. Additionally, no impacts to water surface elevation will be realized upstream or downstream of the Project.

Table 6.4 – Water Surface Elevation Changes Greater than 1ft Alt.2 (Prop) vs Alt.2 (Exis) Condition

T-RETURN	STATION	WSE PROP	WSE EXIS	DELTA
5yr	15745	862.55	861.26	1.3
10yr	15540	862.37	860.72	1.6
	15335	860.23	858.96	1.3
	15745	864.36	862.70	1.7
	15540	864.11	862.34	1.8
20yr	15335	861.61	860.25	1.4
	16305	868.23	867.20	1.0
	15960	867.32	865.48	1.8
	15745	866.77	864.44	2.3
	15540	866.39	863.39	3.0
	15335	864.89	861.65	3.2
50yr	35515	980.87	979.64	1.2
	27335	932.04	931.02	1.0
	27155	931.62	930.07	1.5
	26990	931.02	928.37	2.6
	26780	929.00	927.64	1.4
	26575	928.51	927.34	1.2
	26355	928.01	926.20	1.8
	26170	927.04	924.49	2.5
	25965	926.15	923.25	2.9
	25785	925.44	922.22	3.2
	25600	924.78	921.85	2.9
	25425	923.89	921.12	2.8
	25215	922.46	920.59	1.9
	25000	921.15	919.94	1.2
	24795	919.83	917.51	2.3
	24550	917.68	915.65	2.0
	23975	912.94	911.58	1.4
	23755	911.98	910.82	1.2
	23565	910.93	909.55	1.4
	23365	909.53	907.97	1.6
	23000	907.32	906.00	1.3
	22790	906.59	905.44	1.1
	21440	898.73	897.35	1.4
	21225	897.92	896.31	1.6
	21020	896.70	895.50	1.2
	20845	895.35	893.61	1.7
	20595	894.44	892.82	1.6
	20435	893.89	892.53	1.4
	20280	892.30	891.10	1.2
	20070	891.16	889.59	1.6
	19855	889.45	888.38	1.1
	16305	869.94	868.63	1.3
	16130	869.24	867.95	1.3
	15960	868.87	866.71	2.2
	15745	868.30	865.85	2.4
	15540	867.92	865.00	2.9
	15335	866.29	862.98	3.3
	13190	851.72	850.49	1.2

Table 6.4 (Continued) – Water Surface Elevation Changes Greater than 1ft Alt.2 (Prop) vs Alt.2 (Exis) Condition

T-RETURN	STATION	WSE PROP	WSE EXIS	DELTA
	35515	982.50	981.20	1.3
	34720	977.47	976.36	1.1
	27335	933.66	932.53	1.1
	27155	933.15	931.32	1.8
	26990	932.51	929.65	2.9
	26780	930.59	929.04	1.6
	26575	930.12	928.66	1.5
	26355	929.60	927.45	2.1
	26170	928.69	926.16	2.5
	25965	927.88	924.65	3.2
	25785	927.20	923.37	3.8
	25600	926.51	923.01	3.5
	25425	925.57	922.20	3.4
	25215	924.14	921.47	2.7
	25000	922.85	920.55	2.3
	24795	921.49	918.46	3.0
	24550	919.24	916.58	2.7
	24335	916.20	915.07	1.1
	24115	914.53	913.42	1.1
	23975	914.25	912.35	1.9
	23755	913.30	911.56	1.7
	23565	912.42	910.18	2.2
	23365	911.30	908.77	2.5
	23180	909.53	907.44	2.1
	23000	909.13	907.23	1.9
	22790	908.61	906.81	1.8
100yr	21790	902.61	901.57	1.0
	21615	902.41	899.78	2.6
	21440	901.98	898.45	3.5
	21225	900.98	897.15	3.8
	21020	899.89	896.32	3.6
	20845	898.88	894.59	4.3
	20595	897.80	893.77	4.0
	20435	897.00	893.46	3.5
	20280	895.48	891.86	3.6
	20070	893.48	890.61	2.9
	19855	891.06	889.73	1.3
	16515	871.53	870.54	1.0
	16305	871.23	869.62	1.6
	16130	870.49	868.81	1.7
	15960	870.14	867.73	2.4
	15745	869.56	866.88	2.7
	15540	869.18	866.03	3.1
	15335	867.55	864.19	3.4
	10575	837.75	836.76	1.0
	9595	833.28	831.57	1.7
	9385	832.73	830.66	2.1
	9220	831.98	830.13	1.9
	9025	831.04	829.27	1.8
	3010	810.72	809.70	1.0
	1080	756.70	755.63	1.1
	1030	744.76	743.44	1.3

Table 6.4 (Continued) – Water Surface Elevation Changes Greater than 1ft Alt.2 (Prop) vs Alt.2 (Exis) Condition

T-RETURN	STATION	WSE PROP	WSE EXIS	DELTA
	27545	940	939	1.2
	27335	939	937	1.9
	27155	939	936	2.3
	26990	938	935	2.8
	26780	936	934	2.0
	26575	936	934	2.0
	26355	936	933	2.3
	26170	935	932	2.9
	25965	934	930	4.1
	25785	934	928	5.9
	25600	933	927	5.7
	25425	932	927	5.0
	25215	930	925	5.0
	25000	929	923	6.2
	24795	928	921	6.7
	24550	925	919	5.7
	24335	921	918	3.8
	24115	919	916	3.1
	23975	917	915	2.1
	23755	918	914	4.0
	23565	917	913	4.3
	23365	916	913	3.7
	23180	915	912	3.0
	22925	915	912	2.5
Qcap	22825	914	912	1.8
	22600	913	911	1.4
	22415	912	911	1.1
	22195	911	907	3.6
	22010	910	906	3.7
	21790	908	905	3.1
	21615	908	903	4.6
	21440	907	902	5.7
	21225	906	900	6.4
	21020	905	899	6.4
	20845	904	897	6.4
	20595	903	897	5.8
	20435	902	897	5.1
	20280	900	896	4.1
	20070	899	896	2.8
	19855	897	896	1.2
	16515	876	874	2.1
	16305	876	873	2.4
	16130	875	873	2.3
	15960	875	872	2.5
	15745	874	872	2.3
	15564	874	871	2.6
	15473	872	869	3.0
	12835	856	855	1.1
	12615	856	855	1.2

Under both existing and proposed Project conditions, floodplain areas would be inundated during extreme events (i.e., the 50-Year, 100-Year and Capital floods). The floodplain of the River in this analysis begins at RS 40825 and ends at RS 1000. As the Project is currently designed, the acreage within the River study area that would be subject to flooding would decrease with Project development by as much as 123.8 acres under the 100yr event and 227.3 acres under the Q_{CAP} event because some of the floodplain is proposed to protected from flooding by the placement of the buried soil cement. Project-related structures would not be subject to significant flooding impacts resulting from flows associated with major storm events. Therefore, the Project would not result in significant risk of loss, injury or death to people on the Project site or downstream of the Project site.

Potential for erosion within the River can be evaluated by reviewing changes to hydraulic shear stress or flow velocities, in conjunction with potentially erodible materials. In Los Angeles County, velocities are the preferred indicator for potential streambed erosion. Because the riverbed is composed of alluvial materials, the non-erodible velocities (velocities below which no erosion would occur) range from 2.5 feet per second (fine gravels under clear flow conditions) to 5.0 feet per second (alluvial silts transporting colloidal materials) (Chow, 1959). Therefore, a representative velocity of 4.0 feet per second was determined to be the appropriate indicator for potential erosion.

If a significant amount of the 2- to 100-year and Q_{CAP} floodplain area were in the 0-4-foot per second range, but as a result of the Project (including bridges and bank protection), would be subjected to velocities greater than 4 feet/second, it would be considered to have potentially significant erosion impact. Figures 6.1a - g indicate increases in areas of the River that would be subject to velocities over 4 feet/second.

6.2.2 Utility Corridor Analysis

The Utility Corridor is comprised of four parts: the Water Reclamation Plant (WRP), the Utility Corridor Soil Cement, the Utility Corridor TRM, and the Utility Corridor I-5 component. The WRP has been previously analyzed under the Specific Plan EIR, and the I-5 component was included as part of the Natural River Management Plan EIR and 401/404 permits. An analysis of the impacts of the Utility Corridor Soil Cement has is addressed in other sections of this report.

A preliminary hydraulic analysis of the Utility Corridor TRM has been completed. This analysis evaluated water velocities in the reach between the Project site and the Water Reclamation Plant (WRP) on the River's north bank, STA 22195 to STA 17360. For alternative 7 (avoidance condition) additional TRM is placed upstream to station 23975. A uniform distance from the road and the rail easement to the southern edge of the utility corridor was established for the entire reach. The horizontal location of the corridor was determined to be 67 feet from the rail easement to the edge of the utility corridor. One primary simulation was run in HEC-RAS with the Q_{CAP} flood event (141,426 cfs and 140,776 cfs in the additional upstream portion for alternative 7) under a mixed flow regime and a varied Manning's *n* conditions based on aerial photography analysis. Under these conditions, when the water surface elevation was high enough to reach the banks, the water velocities at the location of the utility corridor were low, ranging from 0.9 to 5.7 ft/s and up to 6.9 ft/s in the upstream portion for alternative 7 (Table 6.5). These modeled velocities would not require hardened bank protection. In this case, approximately 4,600 linear feet of TRM (approximately 6,500 linear feet for alternative 7) will be permanently placed on the bank to ensure protection from erosion.

Table 6.5 - Proposed Q_{CAP} WSE and Velocities along the Utility Corridor (FPS**)**

STATION	WSE	VELOCITY
23975*	918.7	6.0
23755*	917.9	5.9
23565*	917.2	6.9
23365*	NR	NR
23180*	NR	NR
22925*	NR	NR
22895*	NR	NR
22825*	NR	NR
22600*	NR	NR
22415*	NR	NR
22195	NR	NR
22010	NR	NR
21790	908.3	2.0
21615	907.8	2.0
21440	907.3	2.7
21225	906.2	2.1
21020	905.0	2.0
20845	903.9	2.9
20595	902.7	3.1
20435	901.6	2.9
20280	900.0	5.7
20070	898.5	2.3
19855	896.7	4.7
19630	896.0	3.8
19440	895.2	2.0
19240	894.1	1.2
19050	893.6	0.9
18830	892.9	1.2
18650	892.7	1.0
18475	892.5	2.9
18290	892.0	2.7
18025	891.5	1.4
17785	891.0	1.6
17510	888.3	2.6
17360	NR	NR

*note: TRM is placed upstream of section 22195 only for the alternative 7 (avoidance condition).

NR: Water Surface does not reach the bank.

6.2.3 *Impact on Floodplain and Habitat Area*

The proposed improvements associated with the Specific Plan would alter the existing boundary of the River floodplain at the Project site. A summary of the changes in the floodplain area due to the development of the Project is shown in Figure 3.8.

For high frequency floods (2- and 5-year), the proposed floodplain modifications would not hinder flows or reduce the floodplain area. Instead, these flows would spread across the River channel, unaffected by the bank protection because the River would have sufficient width to allow these flows to meander and spread out as under pre-Project conditions. During more infrequent floods River flows would be impacted by proposed improvements as wide as the buried soil cement. This would limit the area of the floodplain during these infrequent flood events, causing inundation over a smaller area because the bank protection will prevent flooding of formerly adjacent floodplain areas. These formerly adjacent areas would be developed under the Specific Plan for various land uses, including residential, commercial, industrial, and parks. Most of the areas being developed consist of agricultural fields and, to a lesser extent, disturbed and upland habitat areas with limited riparian habitat. Some vegetation types are more exposed to flooding in the Project condition where the largest decrease in vegetation, both by percent and acres, results from converting agricultural land to the Project condition.

7 Stream Stability and Floodplain Operation

7.1 Channel Sediment Transport Analysis Approach

7.1.1 SAM Model

The SAM Sediment Hydraulic Package is an integrated system of programs developed through the Flood Damage Reduction and Stream Restoration Research Program to aid in the analyses associated with designing, operating and maintaining flood control channels and stream restoration projects. SAM combines the hydraulic information and the bed material gradation information to compute the sediment transport capacity for a given channel or floodplain hydraulic cross-section for a given discharge at a single point in time. A number of sediment transport functions are available for this analysis and SAM has the ability to assist in selecting the most appropriate sediment transport equation. The SAM.SED module combines the hydraulic parameters with the bed material gradation curve to compute bed material discharge rating curves by size classification. The SAM.AID module provides the user with recommended procedures based on the best matches between hydraulic parameters and grain size gradation of the study reach with the same parameters of selected river. Calibrations based on measured data have been performed between the available procedures and selected rivers. This calibration has shown which procedures best predict the actual sediment transport capacity of a particular river. SAM.SED provides a sediment transport capacity for each discharge. SAM modeling was only performed using the HEC-RAS models for alternative 1 (existing condition) and alternative 2 (proposed project). Data pertaining to alternative 2 is used for proposed alternatives 3 through 6, while data pertaining to alternative 1 is used for proposed alternative 7 (avoidance condition).

7.1.2 Input Data and Selection of Transport Functions

The SAM numerical model is built upon hydraulic and fluvial components. The hydraulic components include representations of river bed characteristics including top width, side slope, hydraulic depth, bed roughness, reach length, energy grade, and discharge. The fluvial component includes representation of bed gradation as percent finer statistics and a selection of up to twenty sediment transport equations.

Hydraulic representation of the river bed is accomplished in several distinct steps. First, the HEC-RAS numerical model is converted to HEC-2 format and run to produce the Army Corps' T95 binary hydraulic simulation output file. Next, the T95 file is then read directly into SAM using the SAM model's M95 subroutine. This methodology is powerful because it ensures that data created for, and analyzed using; HEC-RAS and HEC-2 hydraulic software is fully compatible with, and implemented in, SAM fluvial analyses. Finally, sub-reaches within the model are specified and average hydraulic parameters are calculated for those sub-reaches. Sub-reaches are determined by examining the hydraulic parameters of the individual HEC-RAS cross-sections and identifying correlations between those hydraulic parameters and the longitudinal position in the channel of the individual cross-section. This process is described in detail in 6.2, below.

Representation of sediment grain size distribution in SAM takes the form of percent finer data obtained from sieve analysis of channel sediment grab samples. At each sample location multiple samples are collected and analyzed, and the average data is input into the model. All sampling and sieve analysis was conducted by URS, and sample locations were chosen based on either the presence of recently active alluvium or the presence of adjacent/underlying older alluvium commonly incorporated into stream sediment load during major events. Environmental constraints on subsurface investigations in active drainages limited sampling locations in some instances, and in these cases the most representative, obtainable data is used.

Sediment transport equations used in all SAM modeling were chosen with the assistance of the Army Corps' SAM.AID subroutine. The SAM.AID subroutine determines the most representative transport function based on the hydraulic parameters and percent finer data for each sub-reach by comparing the data with the results of 20 peer-reviewed and widely acknowledged sediment transport studies. This case-by-case transport equation selection is more likely to provide a robust representation of channel sediment transport than choosing and individual transport equation for all reaches. Once the best transport equation matches have been determined by SAM.AID the most representative equations are run for each sub-reach. Sediment transport for each sub-reach can then be estimated by reviewing the calculations of transport from each equation, excluding any outliers, and using the median transport estimate.

7.2 Reach-by-Reach Channel Hydraulic Characterization

As noted in section 6.1.2, SAM modeling is based on channel sub-reaches determined by correlating hydraulic characteristics with longitudinal cross-section location. The hydraulic parameters examined are discharge, energy slope, bed slope, Froude number, top width, flow area and hydraulic velocity. Correlation values typically vary from r=0.0 to r=±0.5. In the case of Santa Clara River, changes in discharge along the River dominated the other hydraulic parameters with respect to sub-reach classification. Therefore, all sub-reaches have been defined based on locations of significant discharge increases within Santa Clara River, and correspond to reaches defined in section 5.

7.3 Results of Sediment Transport Analysis

Table 7-1 - Santa Clara River Existing Conditions Bed Stability

Subreach	US Sta	DS Sta	Trans Eq	Transport (ton)	Top Width (ft)	Depth (ft)	A/D	Grade Change (ft)
SRA1	46195	44210	MPM	403,938	525.6	0.6	AGGRADE	0.6
SRA2	43820	41460	MPM	330,678	977.0	0.4	AGGRADE	0.4
SRA3	41280	38925	MPM	401,167	1,242.2	0.3	DEGRADE	-0.3
SRA4	38710	36265	MPM	343,735	952.0	0.3	AGGRADE	0.3
SRB1	36080	34090	MPM	483,359	1,389.0	0.6	DEGRADE	-0.6
SRB2	33880	32605	MPM	488,063	1,650.3	0.0	DEGRADE	0.0
SRC1	32265	29385	MPM	101,035	1,965.8	0.8	AGGRADE	0.8
SRC2	29140	27155	MPM	470,866	780.8	2.9	DEGRADE	-2.9
SRC3	26990	25000	MPM	558,797	1,492.1	0.4	DEGRADE	-0.4
SRC4	24795	22415	MPM	468,697	2,008.5	0.2	AGGRADE	0.2
SRD1	22195	20070	MPM	675,434	2,009.0	0.6	DEGRADE	-0.6
SRD2	19855	17785	MPM	241,344	1,936.3	1.3	AGGRADE	1.3
SRD3	17510	15335	MPM	623,943	1,812.5	1.2	DEGRADE	-1.2
SRE1	15125	13190	MPM	796,646	1,878.9	0.6	DEGRADE	-0.6
SRE2	13030	11180	MPM	307,423	1,372.4	2.3	AGGRADE	2.3
SRE3	11015	9025	MPM	624,904	1,390.6	1.4	DEGRADE	-1.4

Table 7-2 - Santa Clara River Proposed Conditions Bed Stability

Subreach	US Sta	DS Sta	Trans Eq	Transport (ton)	Top Width (ft)	Depth (ft)	A/D	Grade Change (ft)
SRA1	46195	44210	MPM	403,938	525.6	0.6	AGGRADE	0.6
SRA2	43820	41460	MPM	359,566	958.6	0.2	AGGRADE	0.2
SRA3	41280	38925	MPM	385,857	1,022.2	0.1	DEGRADE	-0.1
SRA4	38710	36265	MPM	370,217	797.6	0.1	AGGRADE	0.1
SRB1	36080	34090	MPM	534,683	1,376.0	0.7	DEGRADE	-0.7
SRB2	33880	32605	MPM	494,553	1,709.1	0.2	AGGRADE	0.2
SRC1	32265	29385	MPM	147,697	1,859.8	0.8	AGGRADE	0.8
SRC2	29140	27155	MPM	389,467	899.2	1.6	DEGRADE	-1.6
SRC3	26990	25000	MPM	633,550	1,159.3	1.3	DEGRADE	-1.3
SRC4	24795	22415	MPM	603,656	860.1	0.2	AGGRADE	0.2
SRD1	22195	20070	MPM	661,922	1,511.4	0.2	DEGRADE	-0.2
SRD2	19855	17785	MPM	319,200	1,431.8	1.4	AGGRADE	1.4
SRD3	17510	15335	MPM	620,768	1,274.3	1.3	DEGRADE	-1.3
SRE1	15125	13190	MPM	731,941	1,588.9	0.4	DEGRADE	-0.4
SRE2	13030	11180	MPM	291,031	1,375.5	2.1	AGGRADE	2.1
SRE3	11015	9025	MPM	635,705	1,399.4	1.5	DEGRADE	-1.5

Table 7-3 - Santa Clara River SAM Existing vs Proposed Conditions Bed Stability

Subreach	US Sta	Existing Conditions Grade Change (ft)	Proposed Conditions Grade Change (ft)	Delta (ft)	Result
SRA1	46195	0.6	0.6	0.0	NO CHANGE
SRA2	43820	0.4	0.2	0.2	DECREASE AGG
SRA3	41280	-0.3	-0.1	-0.2	DECREASE DEG
SRA4	38710	0.3	0.1	0.2	DECREASE AGG
SRB1	36080	-0.6	-0.7	0.1	INCREASE DEG
SRB2	33880	0.0	0.2	-0.2	INCREASE AGG
SRC1	32265	0.8	0.8	0.0	NO CHANGE
SRC2	29140	-2.9	-1.6	-1.3	DECREASE DEG
SRC3	26990	-0.4	-1.3	0.9	INCREASE DEG
SRC4	24795	0.2	0.2	0.0	NO CHANGE
SRD1	22195	-0.6	-0.2	-0.4	DECREASE DEG
SRD2	19855	1.3	1.4	-0.1	INCREASE AGG
SRD3	17510	-1.2	-1.3	0.1	INCREASE DEG
SRE1	15125	-0.6	-0.4	-0.2	DECREASE DEG
SRE2	13030	2.3	2.1	0.2	DECREASE AGG
SRE3	11015	-1.4	-1.5	0.1	INCREASE DEG

7.4 Discussion of Stream Stability and Long-term Trends

Stream stability can be examined based on the change in potential transport between channel sub-reaches. Sub-reaches are readily determined from changes in hydraulic parameters, and frequently the most significant hydraulic parameter in terms of impact on stream stability is discharge (volume per unit time). If a channel sub-reach has equal potential transport both entering and exiting the reach then the sub-reach is said to be in equilibrium. Frequently, however, channel sub-reaches are either in an aggrading or degrading condition. For the purposes of this study, aggrading reaches are those whereby the potential transport entering the reach (the potential transport of the sub-reach upstream of that under immediate consideration) is higher than the potential transport leaving the sub-reach (the potential transport of the sub-reach under immediate consideration). In degrading sub-reaches the opposite is true and potential transport entering the reach is lower than that leaving the sub-reach. While it would appear that downstream sub-reaches would be degrading constantly because discharge generally increases in downstream sub-reaches, in turn increasing the transport potential as one moves downstream, other factors such as hydraulic depth, mean sub-reach velocity, hydraulic top width, and bed slope contribute significantly to potential transport.

To determine stability and long-term trends on the Santa Clara River the 100- and 10-year discharge was calculated for each sub reach. Transport equations chosen for modeling was based on output of the SAM.AID subroutine, as noted above, and potential transport was estimated based on the median potential transport. For Santa Clara River, Laursen-Copeland or Ackers-White equations represented the median values in every case modeled. The results of the simulations are shown in Tables 7.1 to 7.3, above. The tables show how changes in grading and adjustments to the channel profile alter aggradation and degradation patterns in the channel.

7.5 Floodplain Outlet and Inlet Operation

Generally, outlets and inlets to the channel include the upstream channel entrance, the confluence with the River and any inlets which occur along the channel length. There are no diversions away from the channel either existing or in any of the proposed alternatives. Inlets and outlets have a direct influence on the hydraulics, and thus sediment capacity, of the channel. The upstream channel inlet is generally in a natural state and no currently planned improvements are to be made upstream of the channel so no affects on channel stability are expected. The channel confluence with the River will largely be controlled by the aggradation or degradation in the River, as well as episodic River hydraulic events in the form of backwater effects. While the banks will be hardened in the proposed conditions, the influence of the River on long-term bed stability at the River channel outlet is expected to exceed that of the project channel modifications. Along-stream inlets are considered in the modeling as changes to discharge. In the proposed conditions along-stream inlets will be fixed and not allowed to migrate either vertically or horizontally as in the existing condition, although it is generally expected that the locations of the present inlets will be used in the proposed conditions.

8 Summary Comparison of Development Floodplain Hydraulics

8.1 General Discussion

This report presents four project alternatives for the Santa Clara River including the proposed Project alternative, the Avoidance alternative and two intermediate alternatives. The Proposed Project alternative is the preferred alternative and seeks to optimally maintain the integrity of existing resources while providing the greatest benefit to the overall project. The Avoidance alternative is designed to avoid any impacts to Waters of the United States or to areas under the jurisdiction of California Department of Fish and Game. Alternatives 1 and 2 aim to for a middle ground between the Project and Avoidance alternatives.

The four project alternatives include varying amounts of bank protection, drop structures, grade control stabilizers and bridges. Bank protection takes the form of soil cement, grouted riprap or gunite and is utilized to maintain the stability and location of existing and proposed River banks. The combined east and west bank implementation of bank protection for each alternative is presented in Table 8-1 which shows that the most bank protection is proposed for the alternative 2 (proposed project) condition, while alternative 7 (avoidance condition) is proposed to have the least, and the remaining alternatives proposing intermediate total lengths.

Table 8-1 - Proposed Santa Clara River Facilities

Alternative	Combined Linear Feet of Bank Protection	Bridges
Alt. No. 2 (Project)	28956.5	3
Alt. No. 3 & 4	25857.4	2
Alt. No. 5	26066.6	3
Alt. No. 6	25387.1	2
Alt. No. 7 (Avoid)	24883.7	1

Grade control structures are proposed to be comprised of drop structures and grade stabilizers. While the implementation of each structure is different the goal of the placement is the same: drop structures dissipate hydraulic energy and minimize scour while grade stabilizers maintain the bed elevation of a particular reach of channel by minimizing scour through bed hardening. The total grade control structures proposed for each alternative is summarized in Table 8-1. The table shows that the Proposed, first and second alternatives alternative propose a combination of nine and six structures. The avoidance alternative proposed none.

Bridges are infrastructure elements, which while not expressly intended to have hydraulic impacts, may alter bed stability and channel flow. Alterations to bed stability can occur through the influence of piers, abutments and decks. In each of the alternatives proposed for Santa Clara River three existing bridges will be present. Only the downstream bridge at Highway 126 impacts the flow in the River.

8.2 Comparison of Influences to Floodplain

Comparing the various hydraulic parameters for the different alternatives aims to provide insight to the hydraulic impacts caused by modifications to the floodplain. This is because hydraulic parameters, such as velocity, may impact other channel components including vegetation and scour. Table 8-2 compares the change in average channel velocity between the existing condition and each of the alternatives. For the lower frequency events the table shows that velocity is reduced in all cases except the Avoidance alternative where no change occurs. The reduction is the result of changing the channel from the varied channel bottom and cross-section to one with a regular, trapezoidal shape which provides additional flow area. The Avoidance alternative does not demonstrate any variation from the existing condition during more frequent events because the water surface elevation has not risen to the level of the channel improvements. For less frequent events, velocity increases in all of the alternatives. This is because the channel has been given a regular trapezoidal shape that reduces the area of the floodplain, as well as reducing the irregularity of the channel bottom and reducing impedance to flow.

Table 8-2 - Change in Average Velocity Compared to Existing Conditions

Event	Alt. No. 2 (Project)	Alt. No. 3 & 4	Alt. No. 5	Alt. No. 6	Alt. No. 7(Avoid)
2	NC	NC	NC	NC	NC
5	NC	NC	NC	NC	NC
10	NC	+	NC	NC	NC
20	+	+	+	+	NC
50	-	NC	-	-	+
100	-	-	NC	-	+
Qcap	+	+	+	+	+

Tables 8-3 and 8-4 compare the maximum depth and top width for the existing and proposed conditions, respectively. Generally, the tables show a strong adherence to Manning's equation such that in increase in velocity between existing conditions and an alternative is related to a decrease in depth and/or a decrease in top width. The specifics are detailed in Section 4.

Table 8-3 - Change in Maximum Depth Compared to Existing Conditions

Event	Alt. No. 2 (Project)	Alt. No. 3 & 4	Alt. No. 5	Alt. No. 6	Alt. No. 7(Avoid)
2	NC	NC	NC	NC	NC
5	NC	NC	NC	NC	NC
10	NC	NC	NC	NC	NC
20	NC	NC	NC	NC	NC
50	+	+	+	+	+
100	+	+	+	+	+
Qcap	+	+	+	+	+

Table 8-4 - Change in Top Width Compared to Existing Conditions

Event	Alt. No. 2 (Project)	Alt. No. 3 & 4	Alt. No. 5	Alt. No. 6	Alt. No. 7(Avoid)
2	-	+	+	+	+
5	-	+	+	+	+
10	-	-	+	+	-
20	-	-	-	-	-
50	-	-	-	-	+
100	-	-	-	-	-
Qcap	-	-	-	-	-

Table 8-5 compares the total bed shear stress between the existing conditions and the different alternatives. In all cases except the Avoidance alternative shear is reduced. This is a function of reducing flow area, depth of flow and/or friction slope by creating a regular, trapezoidal cross-section in the proposed conditions. The reduction in shear is significant because shear plays an important role in bed aggradation and degradation, as well as impacting the biological makeup of the bed. The Avoidance alternative appears to increase shear because the improvements reduce the overbank spreading of water, reducing the size of the floodplain.

Table 8-5 – Change in Total Shear Compared to Existing Conditions

Event	Alt. No. 2 (Project)	Alt. No. 3 & 4	Alt. No. 5	Alt. No. 6	Alt. No. 7(Avoid)
2	NC	NC	NC	NC	NC
5	NC	NC	NC	NC	NC
10	NC	NC	NC	NC	NC
20	+	+	+	+	NC
50	+	+	+	+	+
100	+	+	+	+	+
Qcap	+	+	+	+	+

8.3 Stream Stability

Tables 8-6.1 to 8-6.5 show the relationship of bed stability changes and hydraulic parameter changes between existing and proposed 100-yr conditions. In general, as velocity increases, channel reaches have the potential to degrade more or aggrade less. In some instances, potential transport indicates that reaches will continue to aggrade although velocity increases. This is because while the average velocity and potential transport increase in this reach, they also increase in the upstream reach. As such, there is a smaller relative potential aggradation even though the reach average velocity increases.

An analogous process occurs when average reach velocity decreases while a channel reach continues to degrade. In such a case the relative potential degradation decreases although the average velocity drops. It is possible for potential transport in a given reach to switch from degradation to aggradation even though the velocity increases. In these cases the change in potential bed stability in the reach upstream from aggrading to degrading shift the location of the potential aggradation downstream.

Table 8-6.1 - Change in Bed Stability & Hydraulic Parameters: 100-Yr Alternative 1 (Existing) vs. Alternative 2 (Project) Condition

Reach	River Sta. to Sta.	Alternative 1 (Existing)	Alternative 2 (Project)	Depth	Velocity	Top Width	Total Shear
SRA1	46195-44210	Aggrade	Aggrade	NA	NA	NA	NA
SRA2	43820-41460	Aggrade	Aggrade	NA	NA	NA	NA
SRA3	41280-38925	Degrade	Degrade	+	-	+	+
SRA4	38710-36265	Aggrade	Aggrade	+	-	-	+
SRB1	36080-34090	Degrade	Degrade	+	-	+	+
SRB2	33880-32605	Degrade	Aggrade	+	-	+	+
SRC1	32265-29385	Aggrade	Aggrade	-	-	+	+
SCR2	29140-27155	Degrade	Degrade	+	-	+	-
SRC3	26990-25000	Degrade	Degrade	+	-	-	+
SRC4	24795-22415	Aggrade	Aggrade	+	+	-	+
SRD1	22195-20070	Degrade	Degrade	+	-	-	+
SRD2	19855-17785	Aggrade	Aggrade	-	+	-	+
SRD3	17510-15335	Degrade	Degrade	+	+	-	+
SRE1	15125-13190	Degrade	Degrade	+	+	-	+
SRE2	13030-11180	Aggrade	Aggrade	+	-	+	+
SRE3	11015-9025	Degrade	Degrade	+	-	+	+

Table 8-6.2 - Change in Bed Stability & Hydraulic Parameters: 100-Yr Alternative 1 (Existing) vs. Alternative 3 & 4 Condition

Reach	River Sta. to Sta.	Alternative 1 (Existing)	Alternative 3 & 4	Depth	Velocity	Top Width	Total Shear
SRA1	46195-44210	Aggrade	N/A	NA	NA	NA	NA
SRA2	43820-41460	Aggrade	N/A	NA	NA	NA	NA
SRA3	41280-38925	Degrade	N/A	+	-	+	+
SRA4	38710-36265	Aggrade	N/A	+	-	-	-
SRB1	36080-34090	Degrade	N/A	+	-	+	+
SRB2	33880-32605	Degrade	N/A	+	-	+	+
SRC1	32265-29385	Aggrade	N/A	-	+	+	+
SCR2	29140-27155	Degrade	N/A	+	-	+	-
SRC3	26990-25000	Degrade	N/A	+	-	-	+
SRC4	24795-22415	Aggrade	N/A	+	+	-	+
SRD1	22195-20070	Degrade	N/A	+	-	-	+
SRD2	19855-17785	Aggrade	N/A	-	+	-	+
SRD3	17510-15335	Degrade	N/A	+	-	+	+
SRE1	15125-13190	Degrade	N/A	+	+	-	+
SRE2	13030-11180	Aggrade	N/A	+	-	+	+
SRE3	11015-9025	Degrade	N/A	+	-	+	+

Table 8-6.3 - Change in Bed Stability & Hydraulic Parameters: 100-Yr Alternative 1 (Existing) vs. Alternative 5 Condition

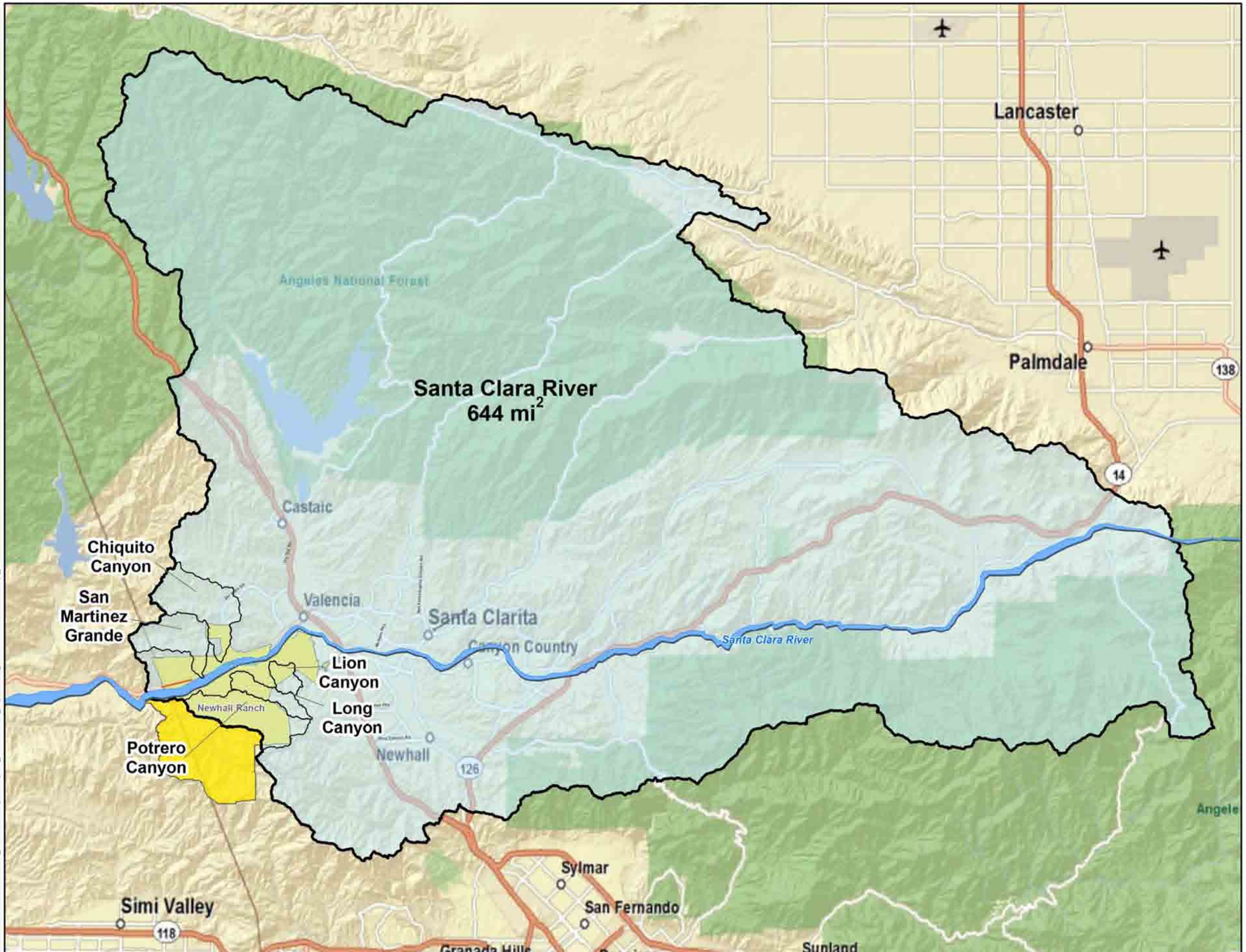
Reach	River Sta. to Sta.	Alternative 1 (Existing)	Alternative 5	Depth	Velocity	Top Width	Total Shear
SRA1	46195-44210	Aggrade	N/A	NA	NA	NA	NA
SRA2	43820-41460	Aggrade	N/A	NA	NA	NA	NA
SRA3	41280-38925	Degrade	N/A	+	+	+	+
SRA4	38710-36265	Aggrade	N/A	+	-	-	-
SRB1	36080-34090	Degrade	N/A	+	-	+	+
SRB2	33880-32605	Degrade	N/A	+	+	-	+
SRC1	32265-29385	Aggrade	N/A	-	+	+	+
SCR2	29140-27155	Degrade	N/A	+	-	+	-
SRC3	26990-25000	Degrade	N/A	+	-	-	+
SRC4	24795-22415	Aggrade	N/A	+	+	-	+
SRD1	22195-20070	Degrade	N/A	+	-	-	+
SRD2	19855-17785	Aggrade	N/A	-	+	-	+
SRD3	17510-15335	Degrade	N/A	+	+	-	+
SRE1	15125-13190	Degrade	N/A	+	+	-	+
SRE2	13030-11180	Aggrade	N/A	+	-	+	+
SRE3	11015-9025	Degrade	N/A	+	-	-	+

Table 8-6.4 - Change in Bed Stability & Hydraulic Parameters: 100-Yr Alternative 1 (Existing) vs. Alternative 6 Condition

Reach	River Sta. to Sta.	Alternative 1 (Existing)	Alternative 6	Depth	Velocity	Top Width	Total Shear
SRA1	46195-44210	Aggrade	N/A	NA	NA	NA	NA
SRA2	43820-41460	Aggrade	N/A	NA	NA	NA	NA
SRA3	41280-38925	Degrade	N/A	+	+	+	+
SRA4	38710-36265	Aggrade	N/A	+	-	-	-
SRB1	36080-34090	Degrade	N/A	+	-	+	+
SRB2	33880-32605	Degrade	N/A	+	+	-	+
SRC1	32265-29385	Aggrade	N/A	-	+	+	+
SCR2	29140-27155	Degrade	N/A	+	-	+	-
SRC3	26990-25000	Degrade	N/A	+	-	-	+
SRC4	24795-22415	Aggrade	N/A	+	+	-	+
SRD1	22195-20070	Degrade	N/A	+	-	-	+
SRD2	19855-17785	Aggrade	N/A	-	+	-	+
SRD3	17510-15335	Degrade	N/A	+	+	-	+
SRE1	15125-13190	Degrade	N/A	+	+	-	+
SRE2	13030-11180	Aggrade	N/A	+	-	+	+
SRE3	11015-9025	Degrade	N/A	+	-	-	+

Table 8-6.5 – Change in Bed Stability & Hydraulic Parameters: 100-Yr Alternative 1 (Existing) vs. Alternative 7 (Avoidance) Condition

Reach	River Sta. to Sta.	Alternative 1 (Existing)	Alternative 7 (Avoidance)	Depth	Velocity	Top Width	Total Shear
SRA1	46195-44210	Aggrade	N/A	NA	NA	NA	NA
SRA2	43820-41460	Aggrade	N/A	NA	NA	NA	NA
SRA3	41280-38925	Degrade	N/A	+	+	+	+
SRA4	38710-36265	Aggrade	N/A	+	+	+	-
SRB1	36080-34090	Degrade	N/A	+	+	+	+
SRB2	33880-32605	Degrade	N/A	+	+	-	+
SRC1	32265-29385	Aggrade	N/A	-	+	-	+
SCR2	29140-27155	Degrade	N/A	+	-	+	-
SRC3	26990-25000	Degrade	N/A	+	-	+	+
SRC4	24795-22415	Aggrade	N/A	+	+	+	+
SRD1	22195-20070	Degrade	N/A	+	+	+	+
SRD2	19855-17785	Aggrade	N/A	+	+	-	+
SRD3	17510-15335	Degrade	N/A	+	-	+	-
SRE1	15125-13190	Degrade	N/A	-	+	-	+
SRE2	13030-11180	Aggrade	N/A	+	+	-	+
SRE3	11015-9025	Degrade	N/A	+	+	+	+



NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Santa Clara River
- Watershed Boundaries

9,000	4,500	0	9,000	Feet
2,500	1,250	0	2,500	Meters

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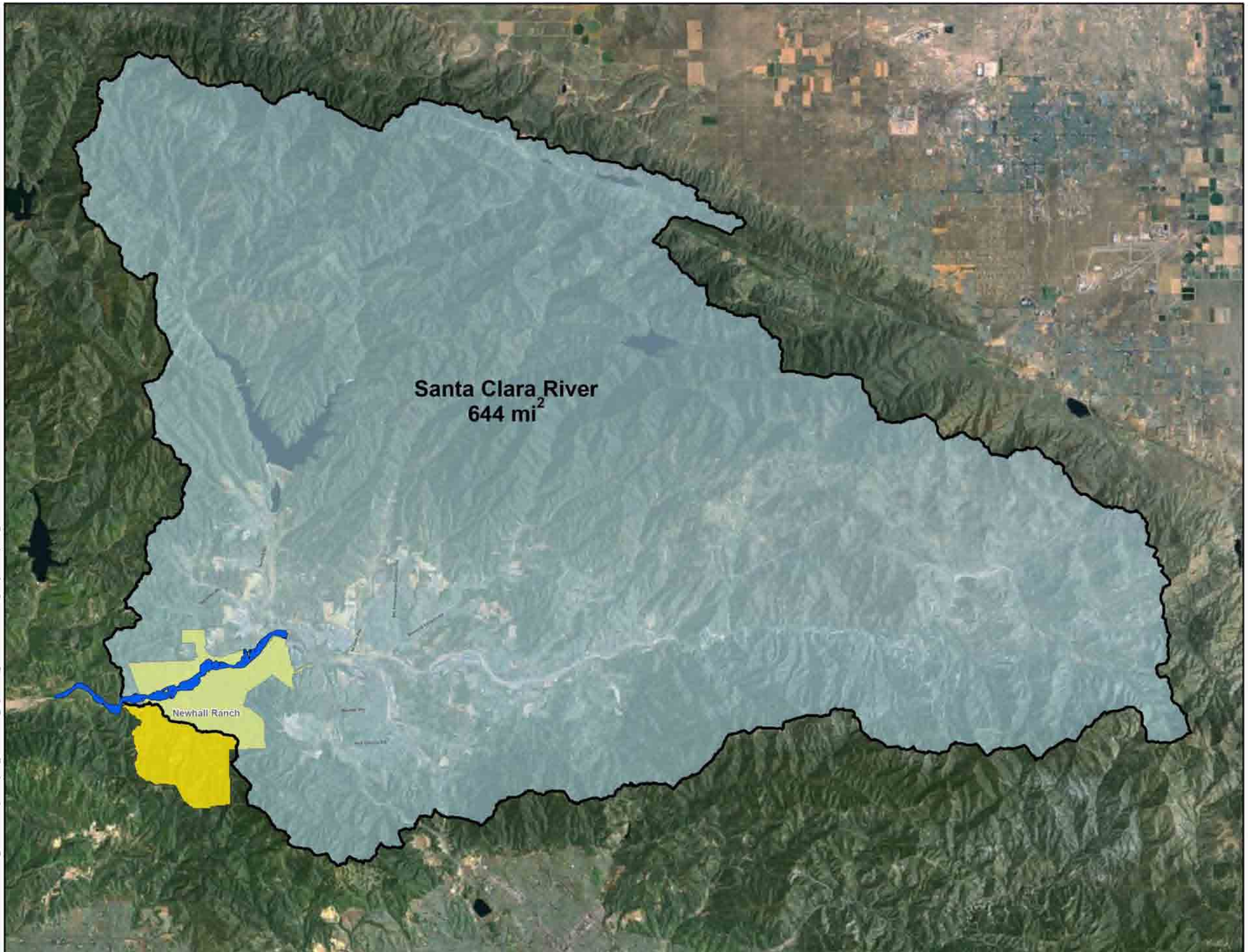
Figure 1.1

WATERSHED LOCATION MAP
SANTA CLARA RIVER

P:\1704E6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\1704E_Figure-1-1_WatershedLocationMap_121608.mxd



NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

Newhall Ranch Specific Plan Boundary
Existing 100-Year Floodplain
Watershed Boundary

Feet: 9,000 4,500 0 9,000
Meters: 2,500 1,250 0 2,500

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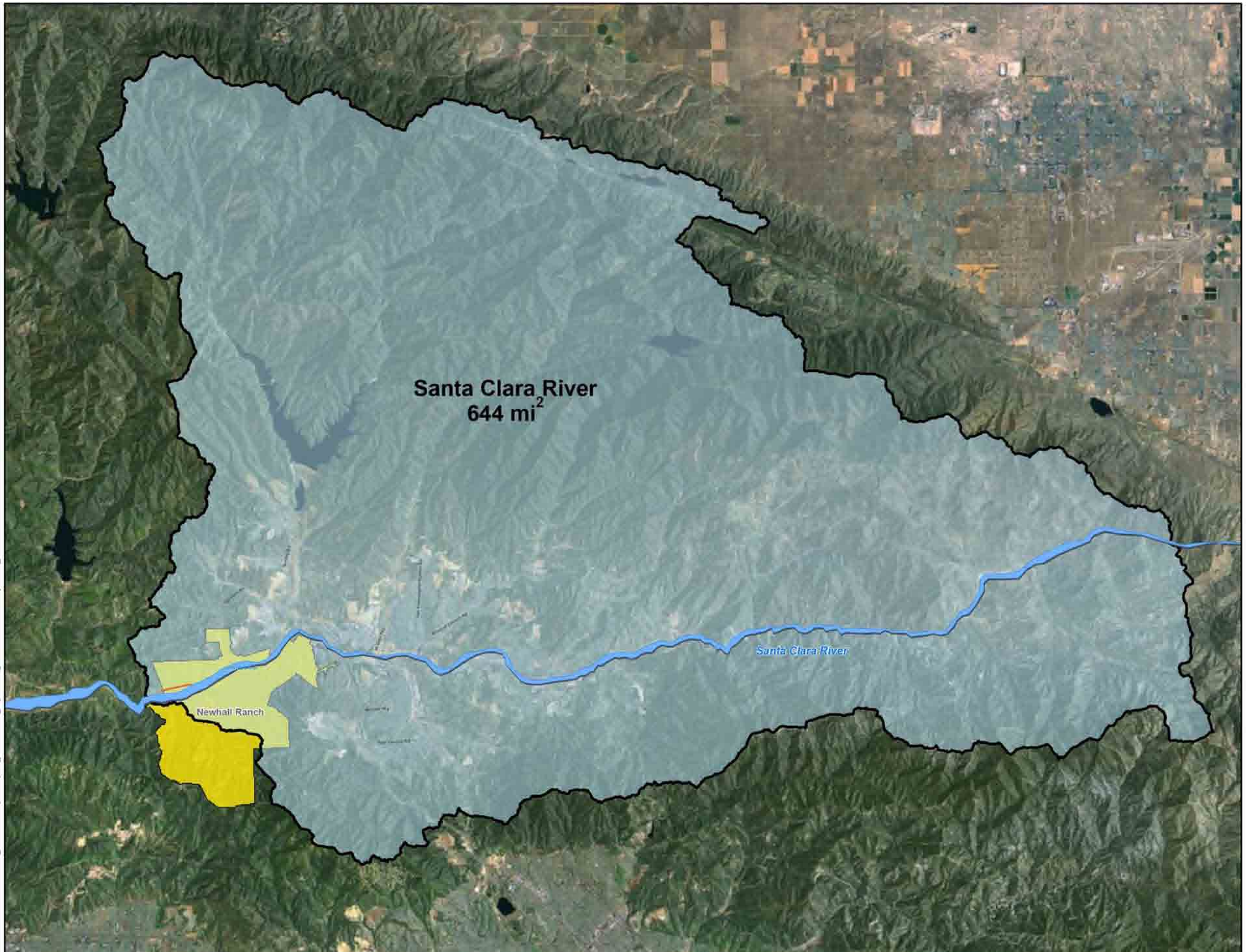
Figure 1.2
WATERSHED BOUNDARY WITH EXISTING 100 YEAR FLOODPLAIN SANTA CLARA RIVER

P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-1-2_WatershedExisting100yrFloodplain_121608.mxd



NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Santa Clara River
- Watershed Boundaries

Feet: 9,000 4,500 0 9,000
Meters: 2,500 1,250 0 2,500

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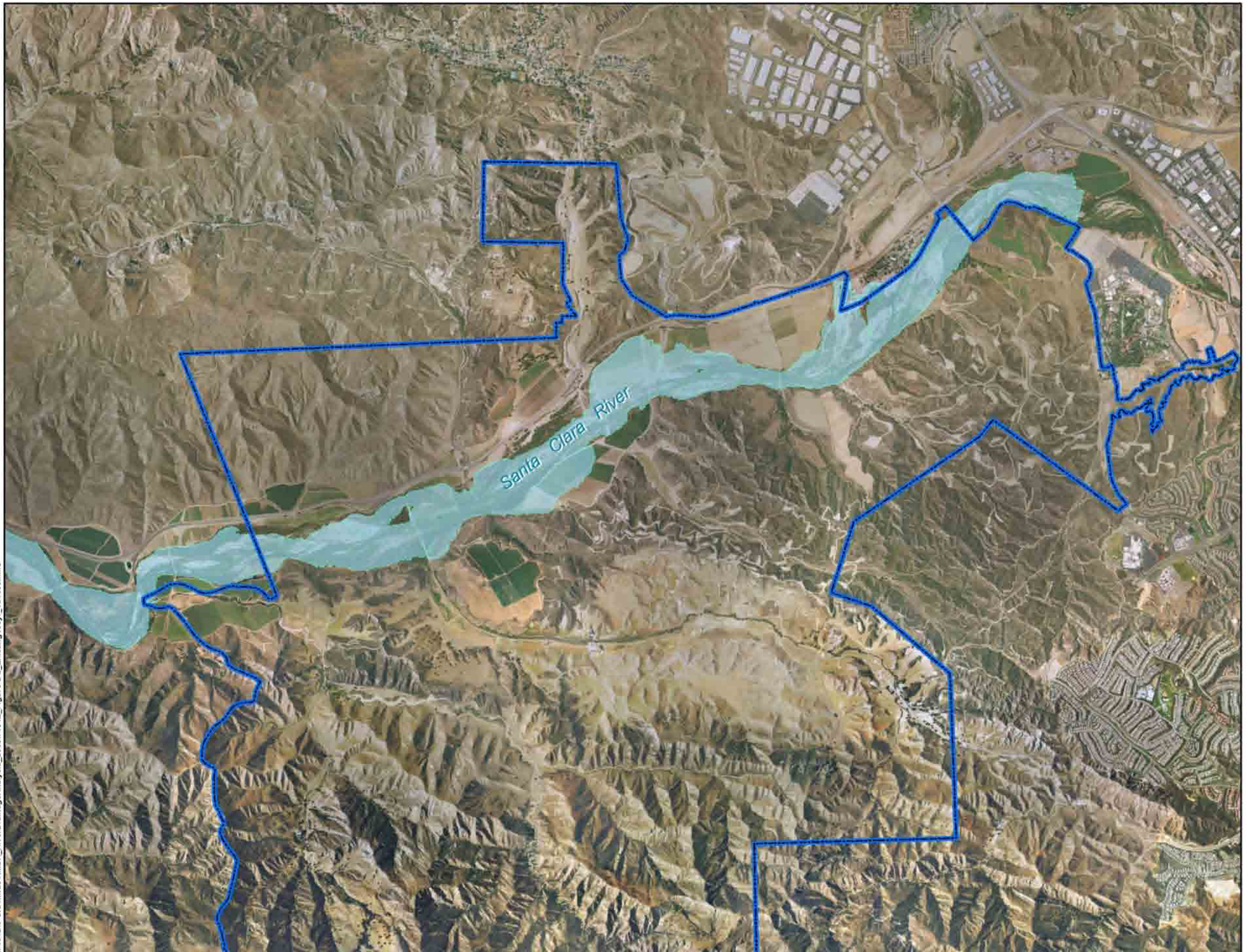
Figure 2.1
**WATERSHED BOUNDARY
AERIAL BASE
SANTA CLARA RIVER**

P:\1104E6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\1104E_Figure-2-1_WatershedBoundaryAerial_121608.mxd



NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

Existing 100-Year Floodplain

Newhall Ranch Specific Plan Boundary

1,600 800 0 1,600 Feet

500 250 0 500 Meters

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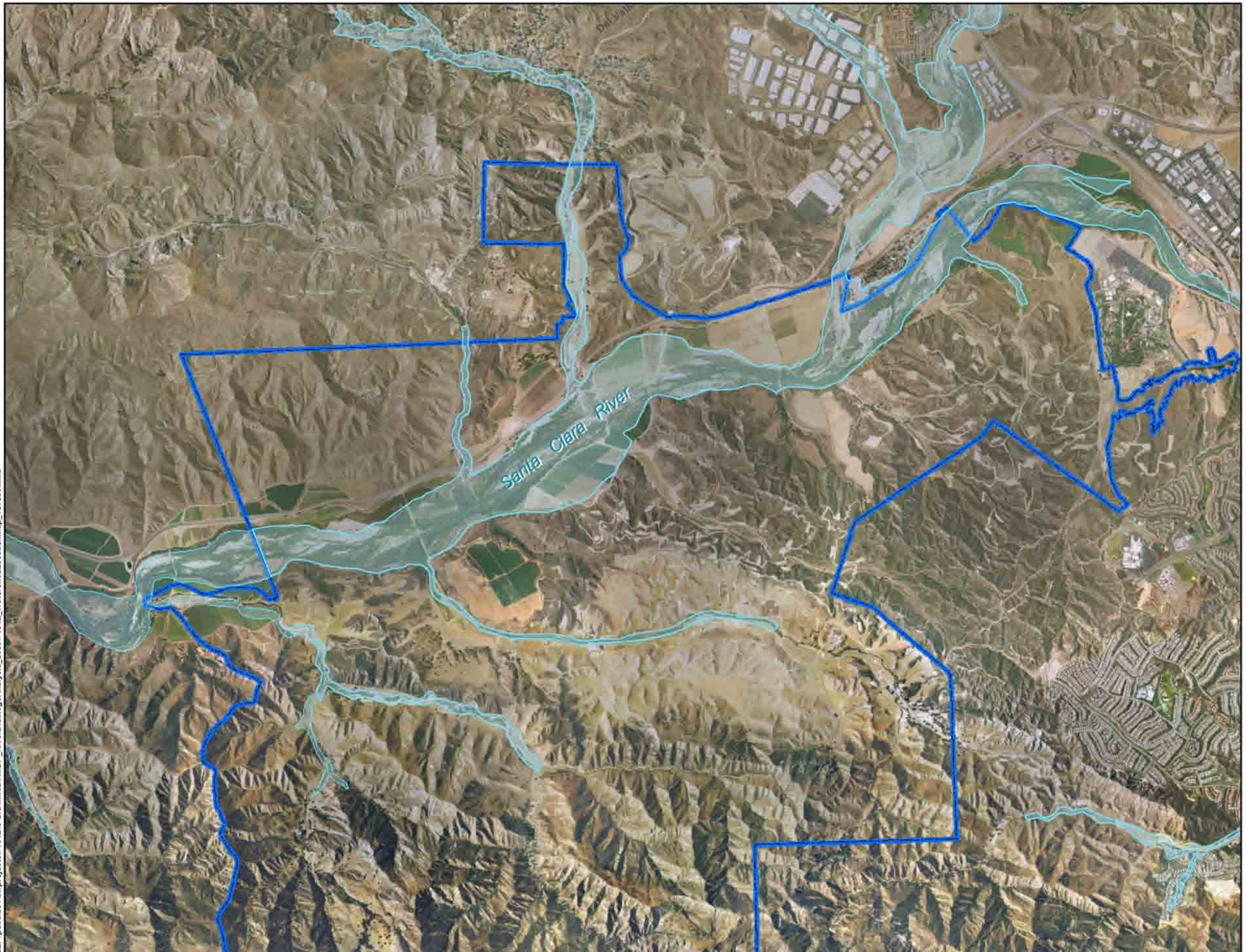
Figure 2.2
EXISTING 100 YEAR
FLOOD HAZARD ZONE
SANTA CLARA RIVER

P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-2-2_Existing100yr_121608.mxd



NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

Mapped FEMA 100 Year Flood Hazard Zone

Newhall Ranch Specific Plan Boundary

Feet
1,600 800 0 1,600
Meters
500 250 0 500

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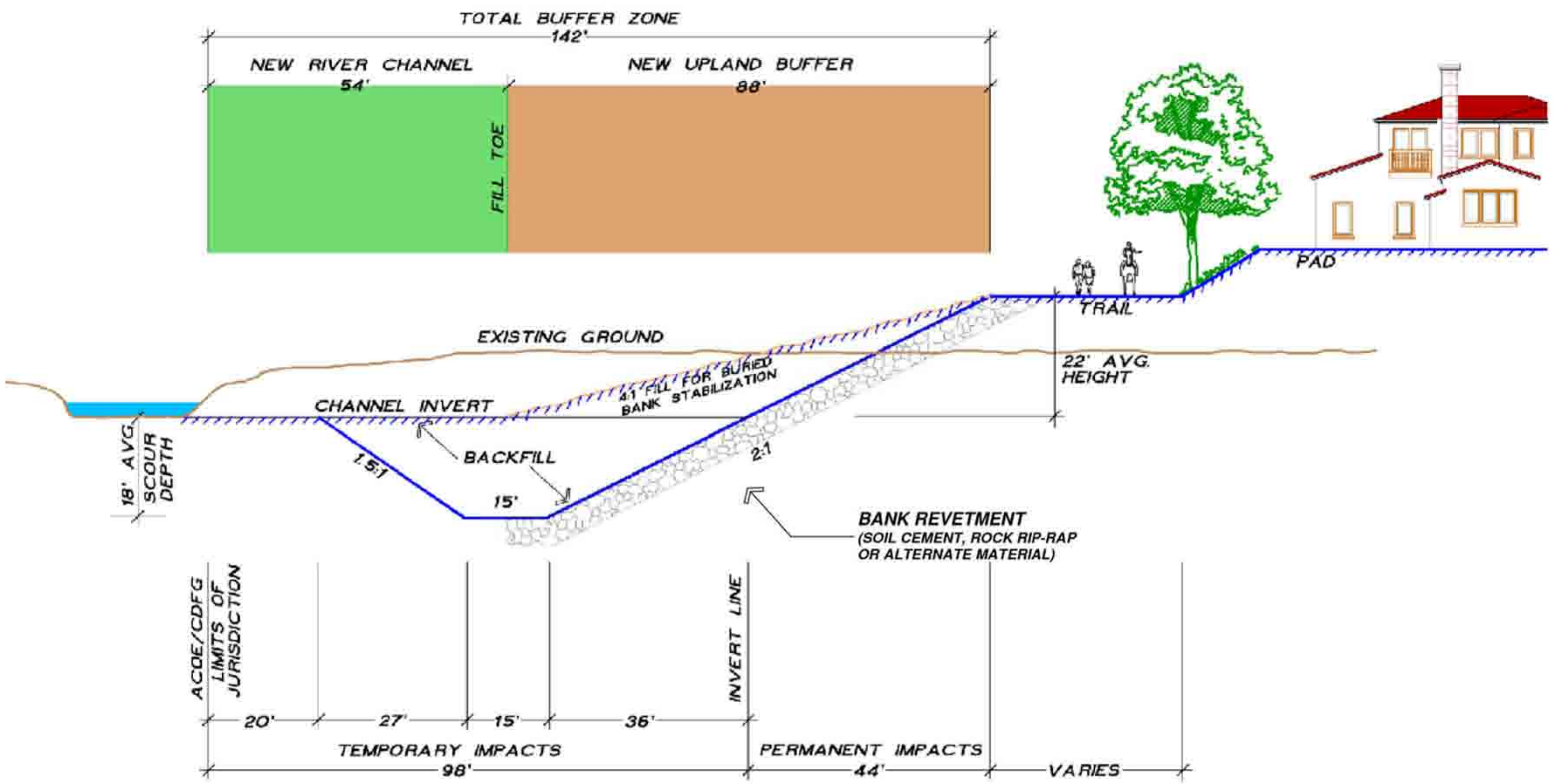
Advanced Water Engineering

Figure 2.3
MAPPED FEMA 100 YEAR FLOOD HAZARD ZONE SANTA CLARA RIVER

FILE: \\pacefs01\swprojects\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_WatershedLocationMap_121608.mxd



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NEWHALL LAND
A LENNAR/LNR COMPANY

LEGEND

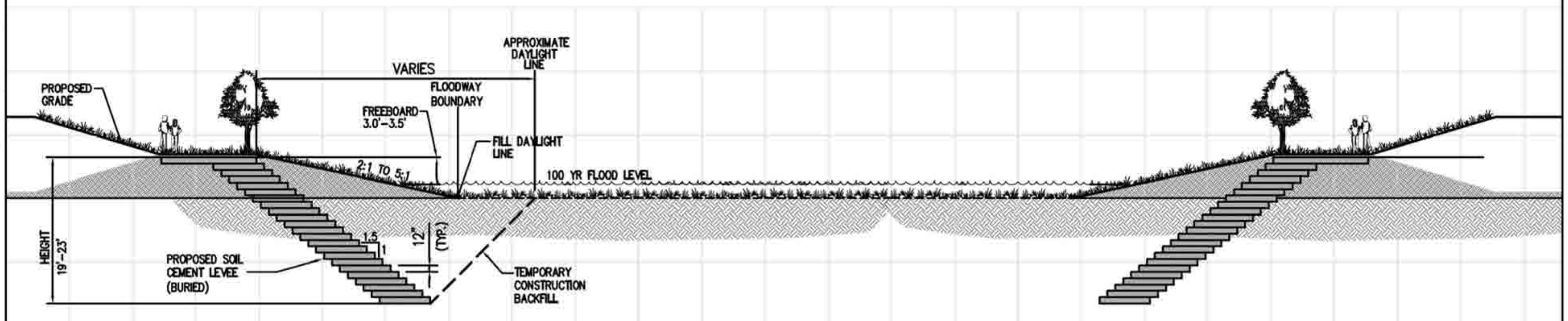
Not to Scale

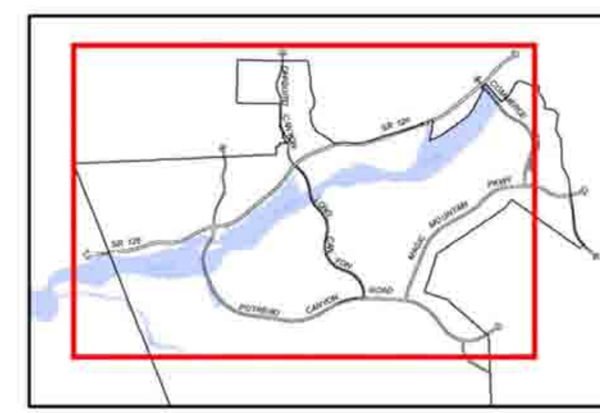
PACE

Figure 3.1
TYPICAL CROSS SECTION
SANTA CLARA RIVER
BANK STABILIZATION

NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D





0 5 10 20 Feet

PACE PACIFIC ADVANCED CIVIL ENGINEERING

Figure 3.2

TYPICAL SOIL CEMENT LINING
SANTA CLARA RIVER

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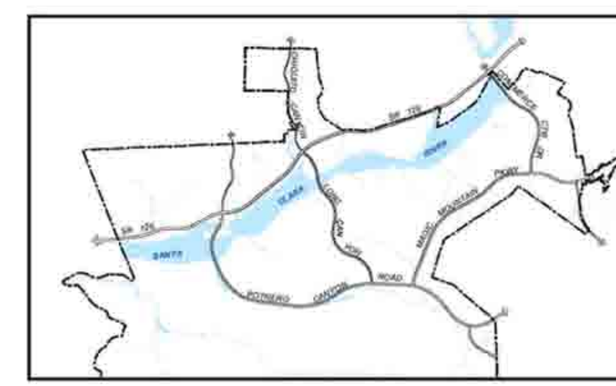
NEWHALL LAND
A LENNAR/LNR COMPANY

LEGEND

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations



Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

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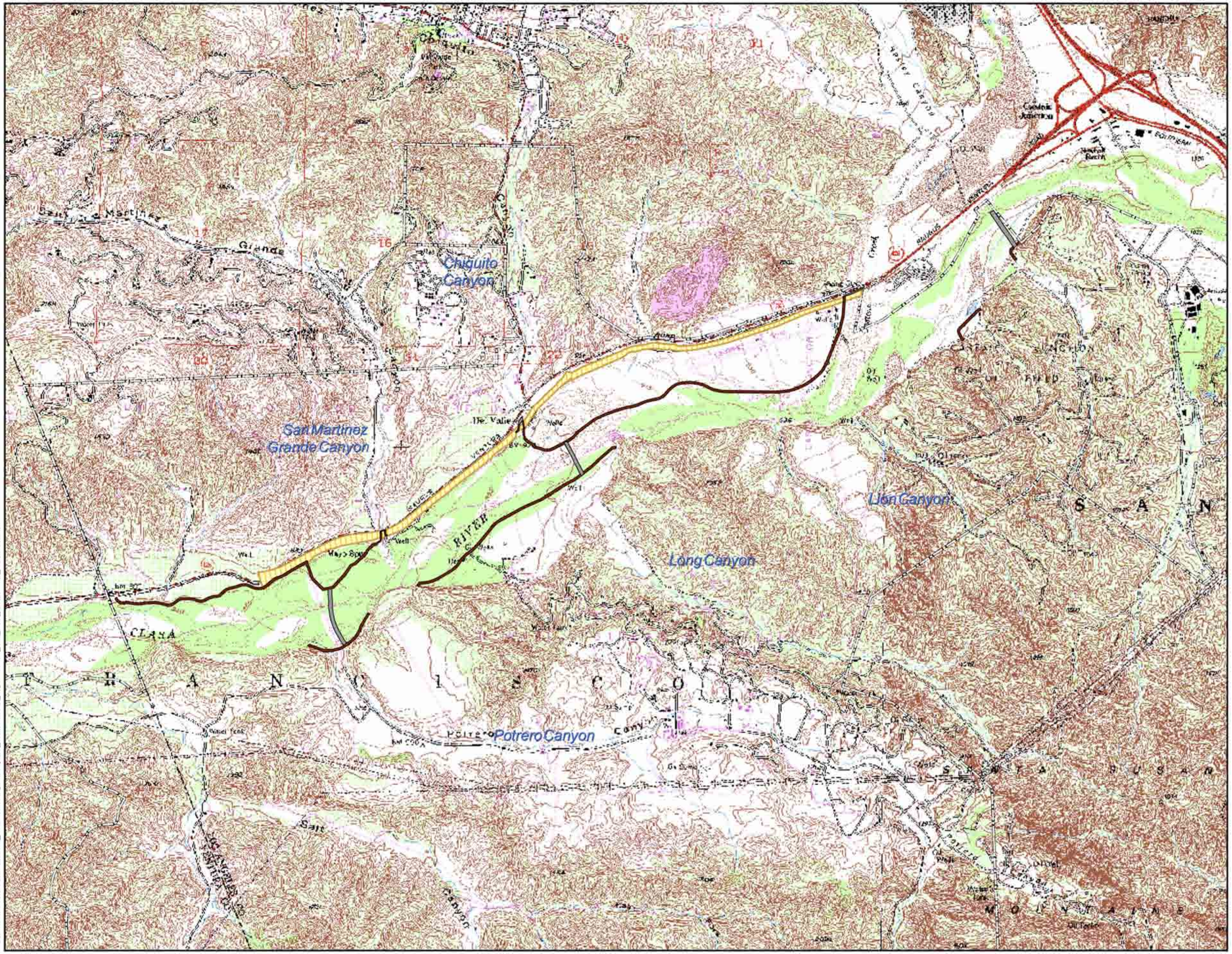
Figure 3.3a

ALTERNATIVE 2 (PROPOSED PROJECT)
BANK STABILIZATION - AERIAL BASE
SANTA CLARA RIVER

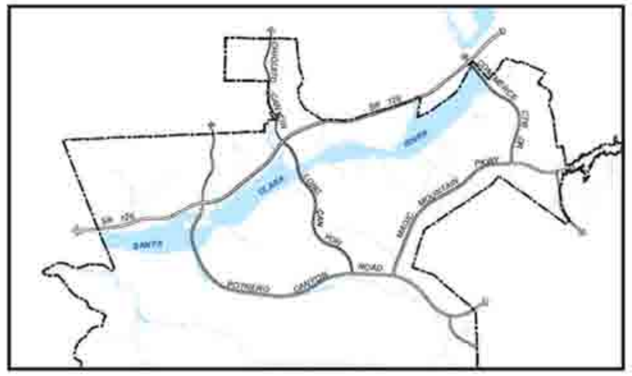


NEWHALL LAND

A LENNAR/LNR COMPANY

LEGEND

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations



1,750 875 0 1,750 Feet

500 250 0 500 Meters

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Figure 3.3b

ALTERNATIVE 2 (PROPOSED PROJECT) BANK STABILIZATION - USGS TOPO SANTA CLARA RIVER

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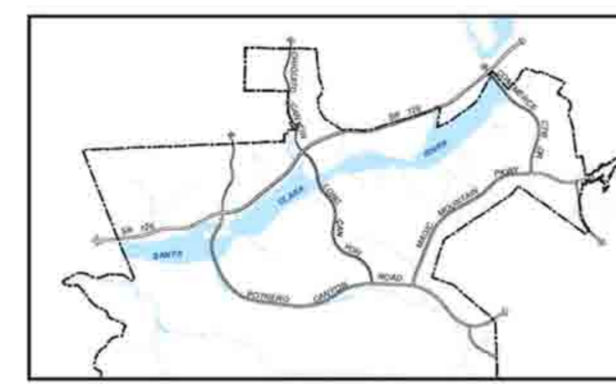
NEWHALL LAND
A LENNAR/LNR COMPANY

LEGEND

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations



Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

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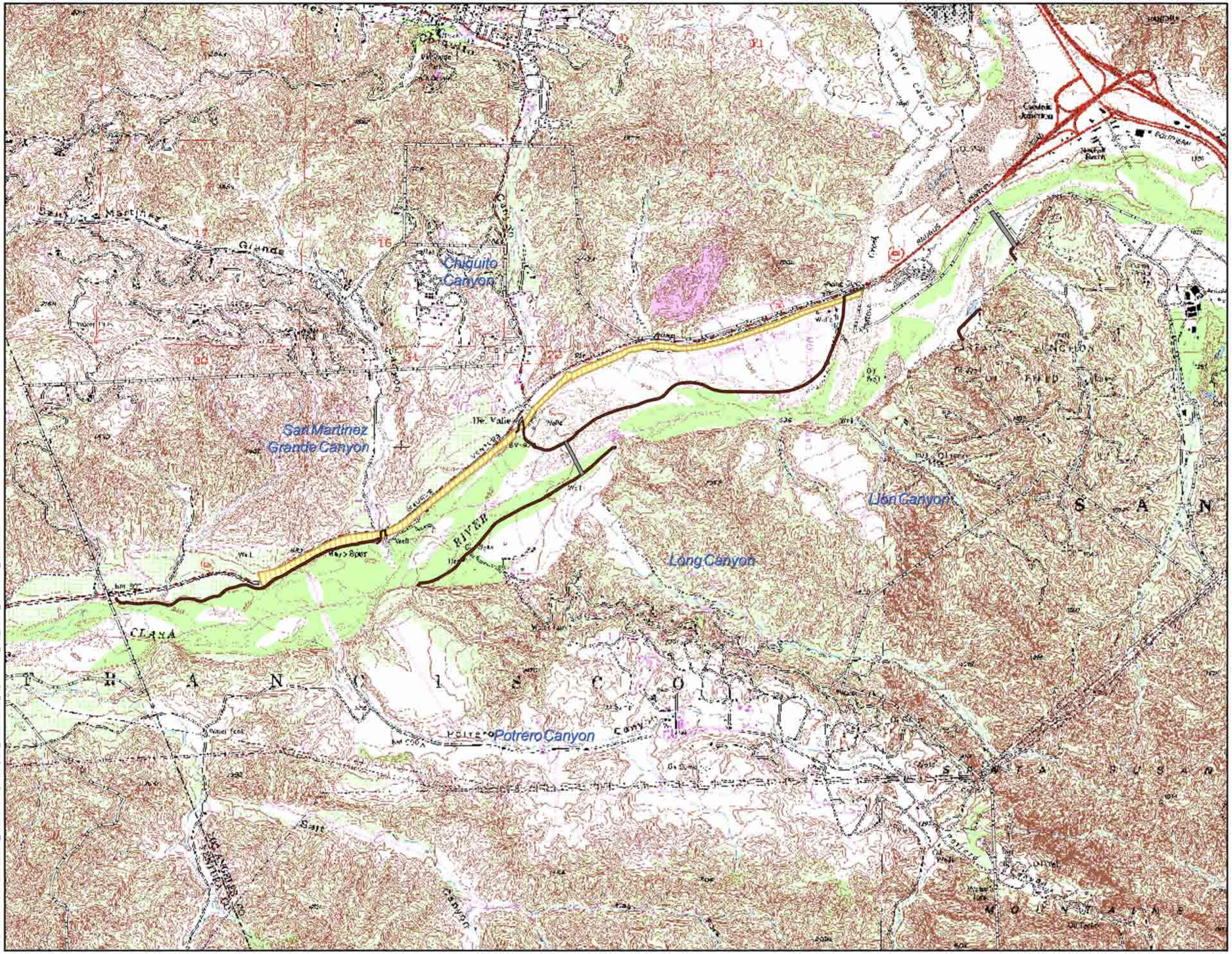
Figure 3.4a

ALTERNATIVE 3 & 4
BANK STABILIZATION - AERIAL BASE
SANTA CLARA RIVER

P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-3-4a_scr_Alt3-4_BankStab_112108.mxd



NEWHALL LAND
A LENNAR/LNR COMPANY

LEGEND

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations

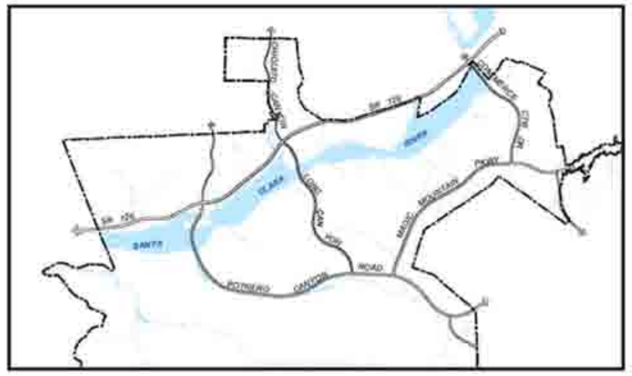


Figure 3.4b

ALTERNATIVE 3 & 4
BANK STABILIZATION - USGS TOPO
SANTA CLARA RIVER

NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

Newhall Ranch Specific Plan Boundary
Bank Stabilization
Utility Corridor
Bridge Locations

Feet
1,750 875 0 1,750
Meters
500 250 0 500

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Figure 3.5a
ALTERNATIVE 5
BANK STABILIZATION - AERIAL BASE
SANTA CLARA RIVER

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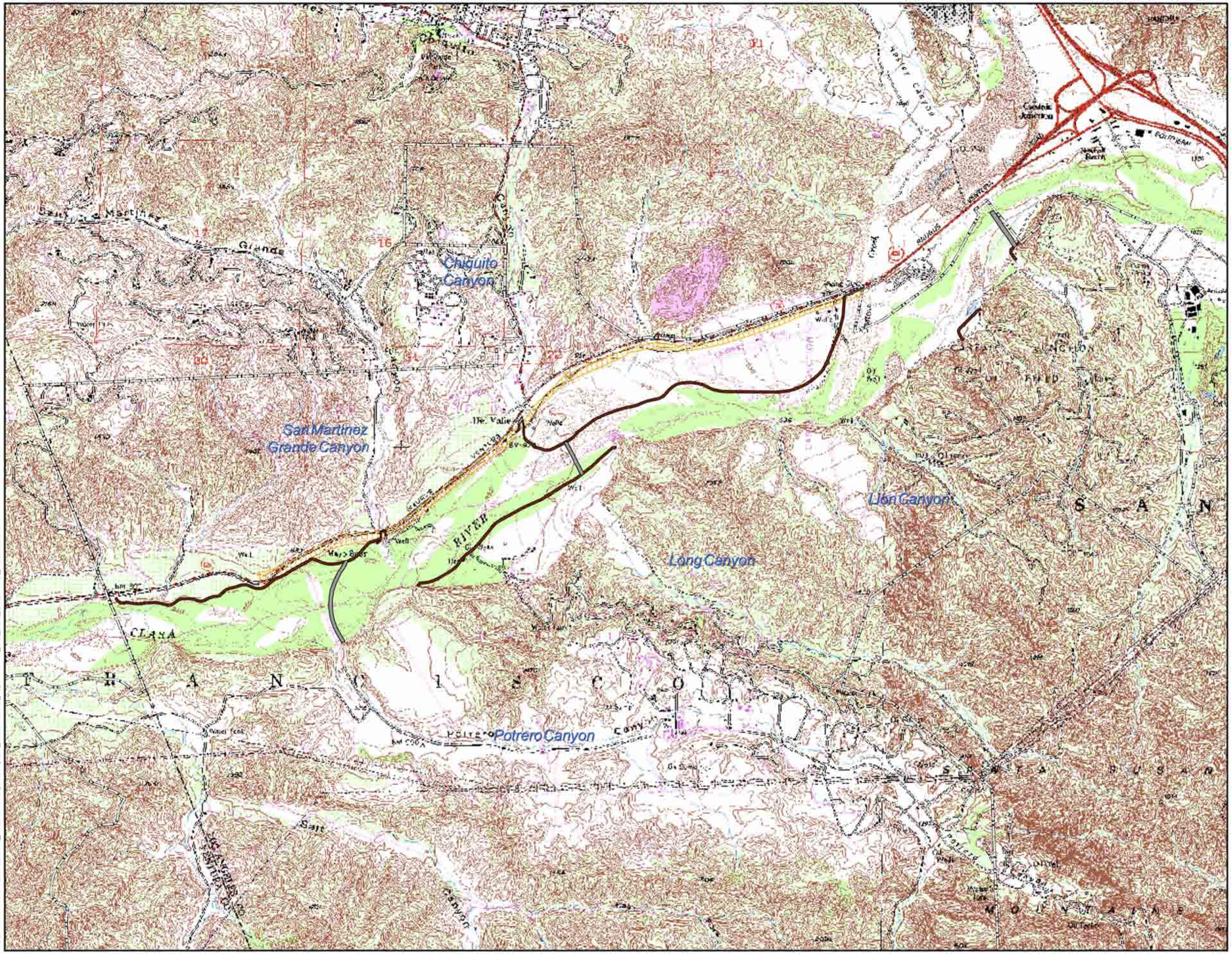
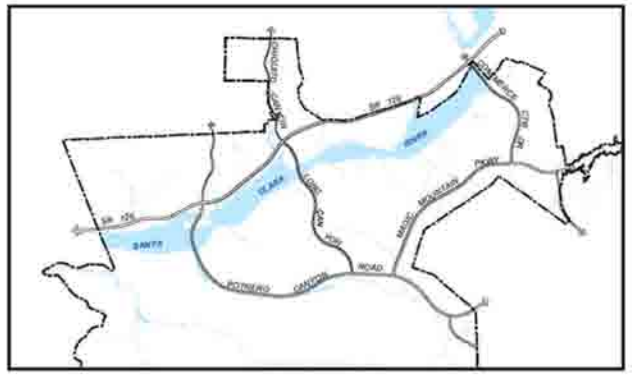


NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations



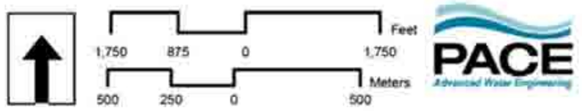


Figure 3.5b
ALTERNATIVE 5
BANK STABILIZATION - USGS TOPO
SANTA CLARA RIVER

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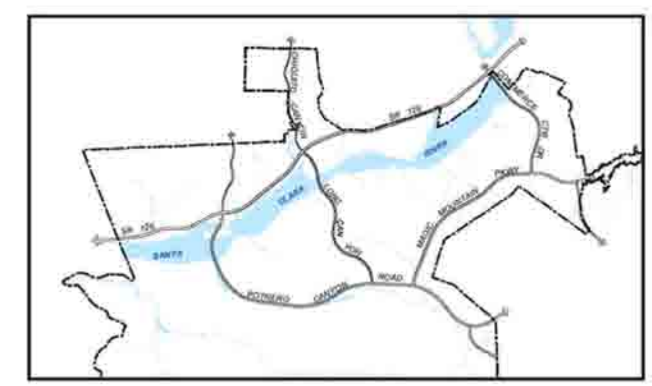
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations



Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

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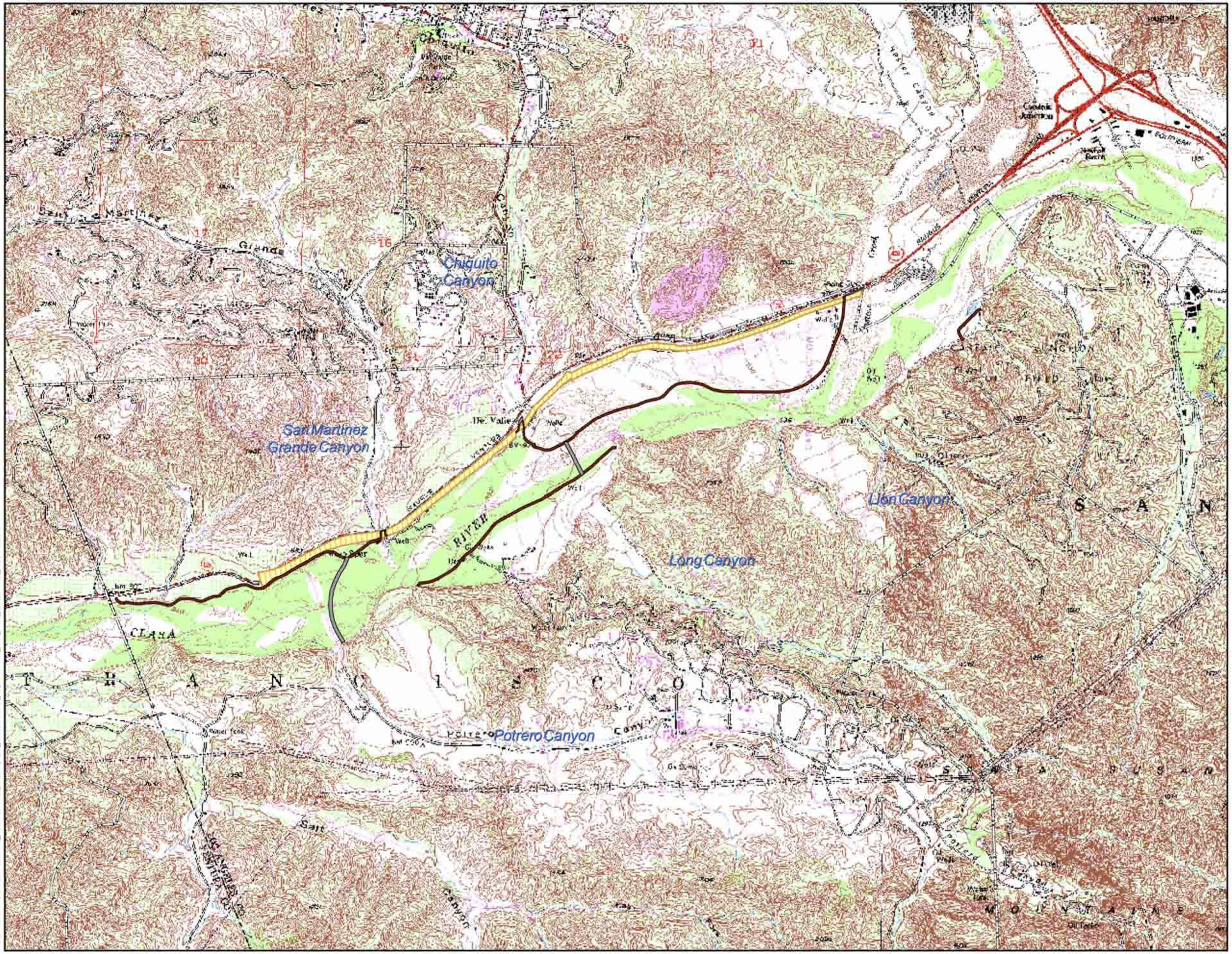
Figure 3.6a

ALTERNATIVE 6
BANK STABILIZATION - AERIAL BASE
SANTA CLARA RIVER



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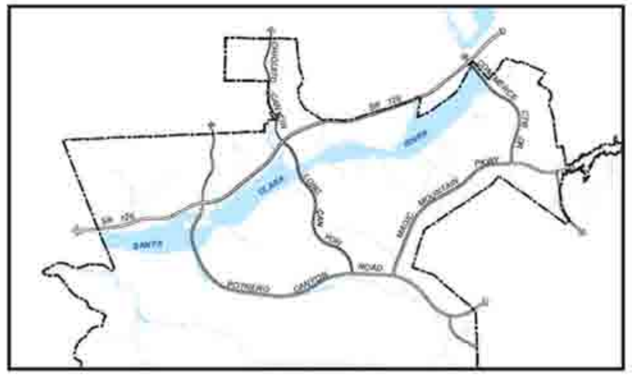
NEWHALL LAND
A LENNAR/LNR COMPANY

LEGEND

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations



Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

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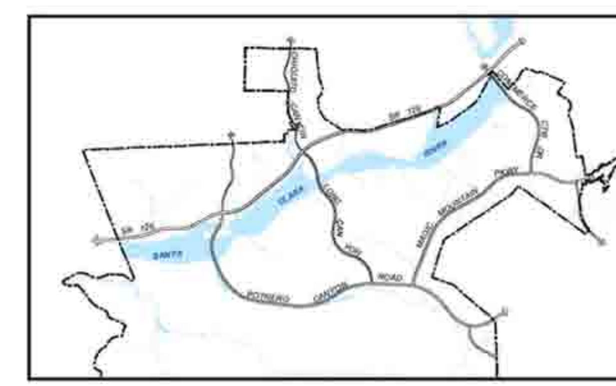
Figure 3.6b

ALTERNATIVE 6
BANK STABILIZATION - USGS TOPO
SANTA CLARA RIVER

NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations



Feet: 1,250 625 0 1,250
Meters: 380 190 0 380

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Advanced Water Engineering

Figure 3.7a

ALTERNATIVE 7 (Avoidance)
BANK STABILIZATION - AERIAL BASE
SANTA CLARA RIVER

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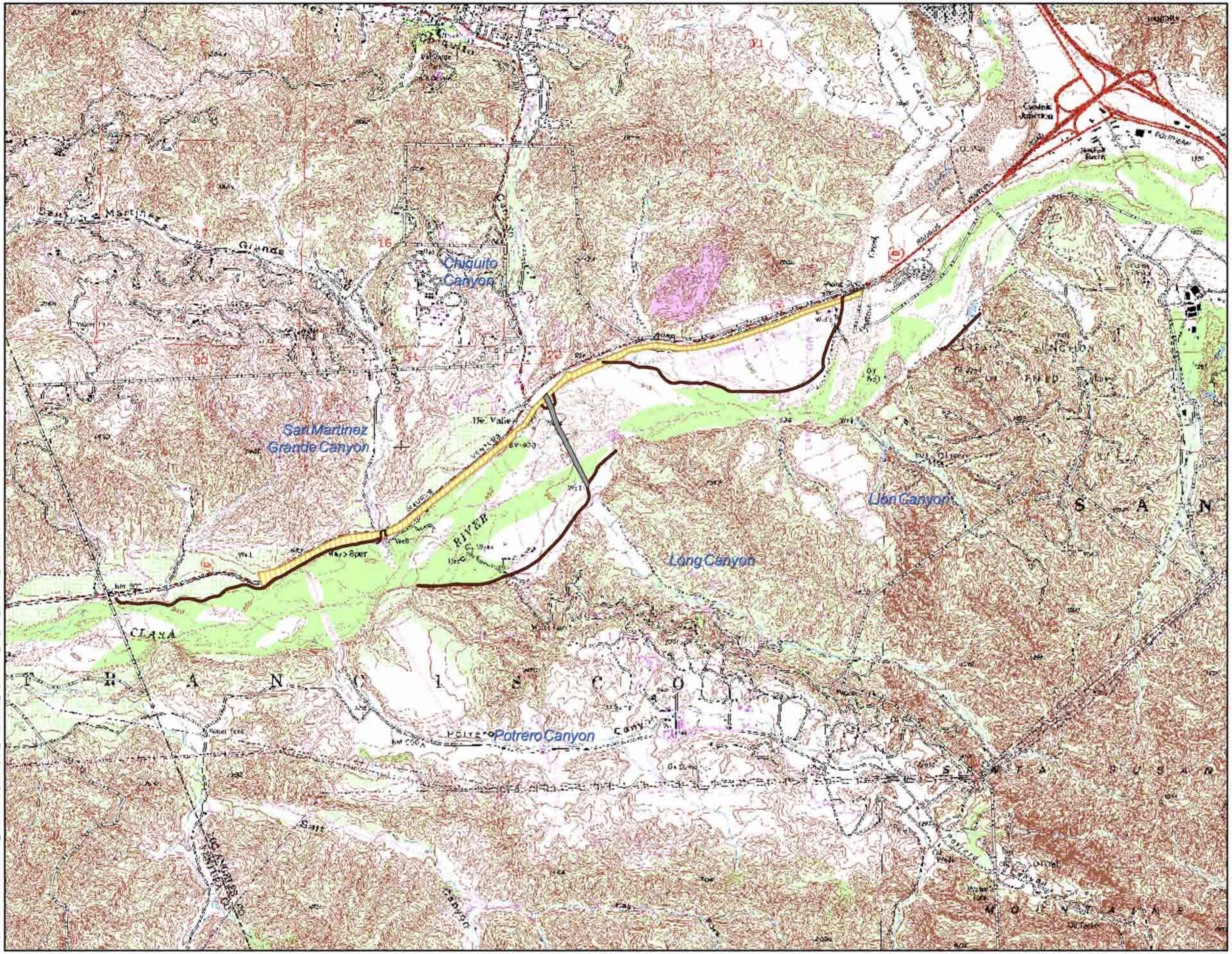

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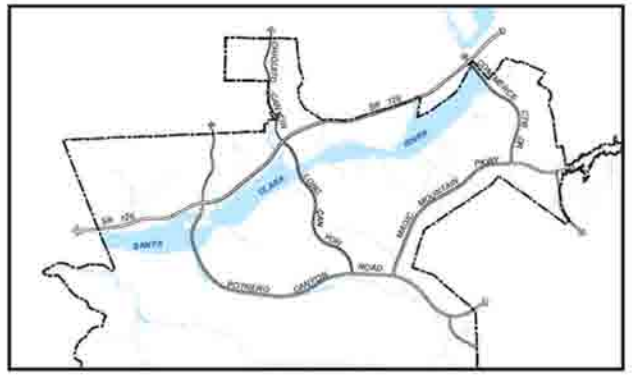
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations



Feet: 1,250 625 0 1,250
Meters: 380 190 0 380

PACE

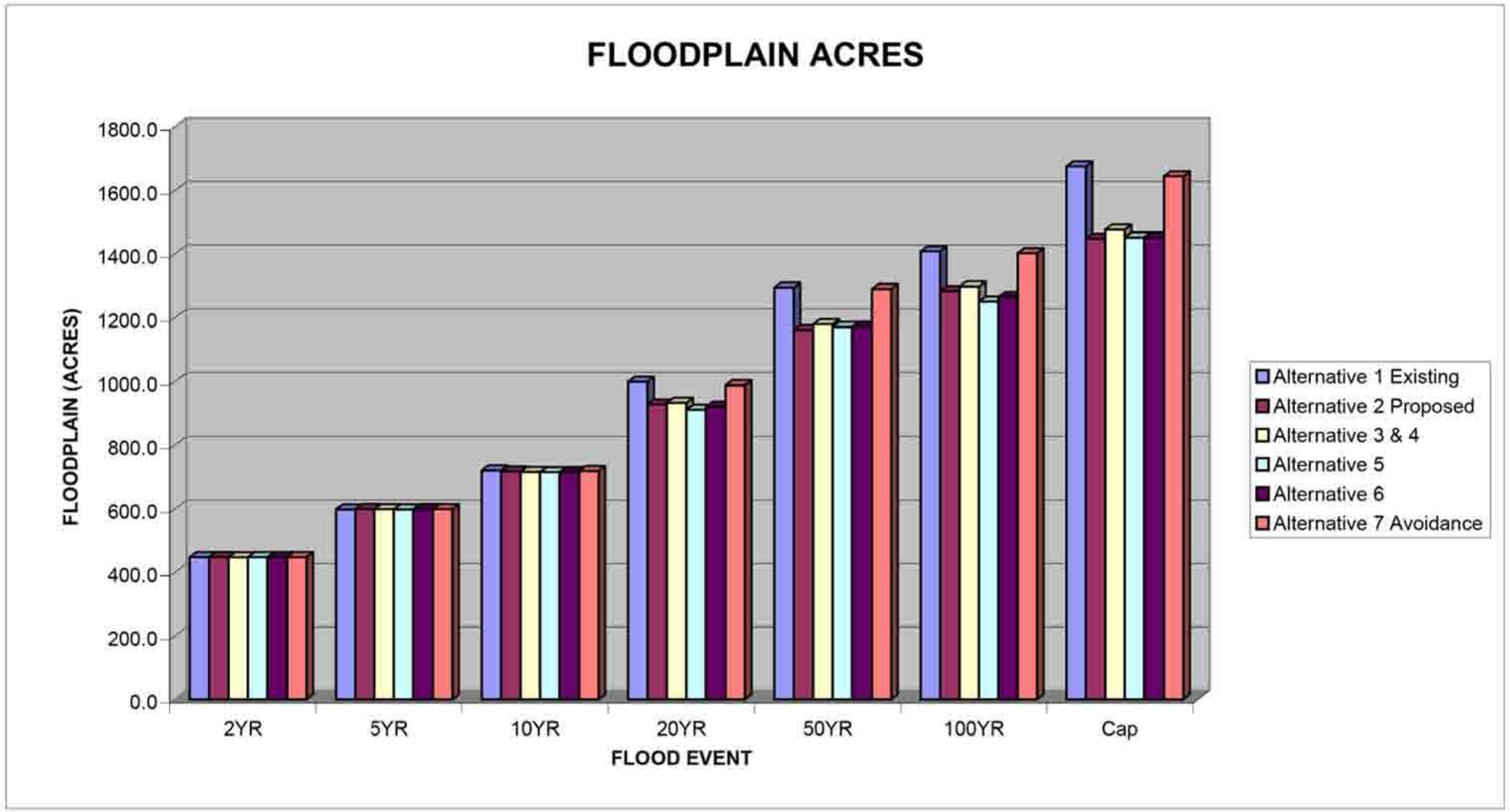
Figure 3.7b

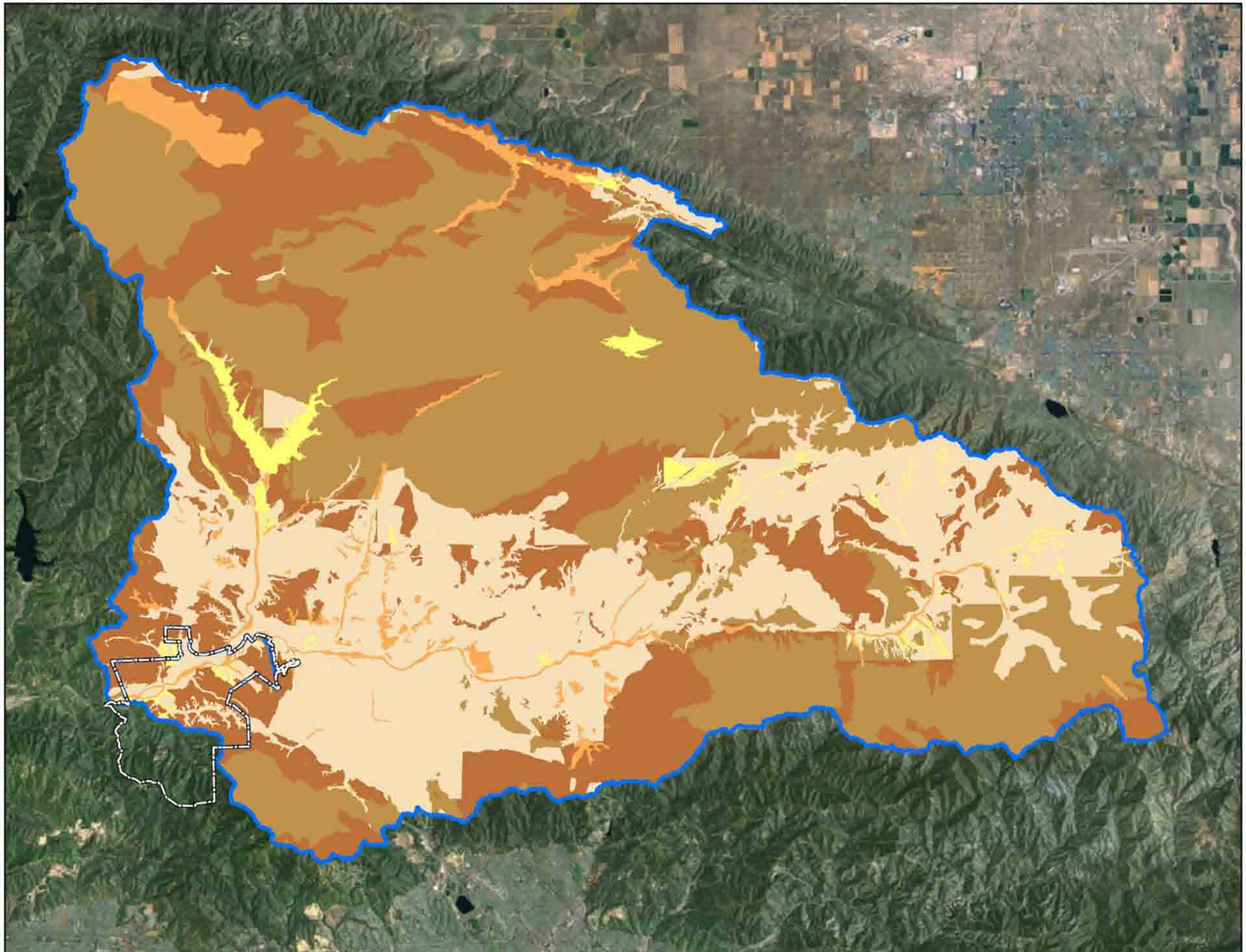
ALTERNATIVE 7 (Avoidance)
BANK STABILIZATION - USGS TOPO
SANTA CLARA RIVER

FIGURE 3.8: FLOODPLAIN ACREAGE COMPARISON

Floodplain Acreage

Flood Frequency	Alternative 1 (Existing) Area	Alternatve 2 (Proposed) Area	Delta	Delta %	Alternative 3&4 Area	Delta	Delta %	Alternative 5 Area	Delta	Delta %	Alternative 6 Area	Delta	Delta %	Alternative 7 (Avoidance) Area	Delta	Delta %
YR	(AC)	(AC)	(AC)	(AC)	(AC)	(AC)	(AC)	(AC)	(AC)	(AC)	(AC)	(AC)	(AC)	(AC)	(AC)	(AC)
2	448	448	0.2	0.0%	447	-0.5	-0.1%	448	0.1	0.0%	448	0.1	0.0%	448	0.1	0.0%
5	598	600	1.1	0.2%	599	0.5	0.1%	598	-0.1	0.0%	600	1.2	0.2%	599	0.8	0.1%
10	720	717	-3.0	-0.4%	715	-4.9	-0.7%	714	-5.7	-0.8%	715	-4.8	-0.7%	718	-1.8	-0.2%
20	999	929	-70.5	-7.1%	934	-65.2	-6.5%	912	-87.3	-8.7%	922	-77.4	-7.7%	988	-10.6	-1.1%
50	1294	1162	-132.5	-10.2%	1180	-114.5	-8.8%	1171	-122.9	-9.5%	1172	-122.0	-9.4%	1290	-4.2	-0.3%
100	1408	1284	-123.8	-8.8%	1298	-109.6	-7.8%	1251	-156.7	-11.1%	1265	-142.3	-10.1%	1402	-5.4	-0.4%
CAP	1675	1448	-227.3	-13.6%	1477	-197.6	-11.8%	1451	-223.9	-13.4%	1452	-222.6	-13.3%	1644	-31.1	-1.9%





NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

Watershed Boundary

Newhall Ranch Specific Plan Boundary

Hydrologic Soil Groups

Hydrologic Soil Group A *

Hydrologic Soil Group B *

Hydrologic Soil Group C *

Hydrologic Soil Group D *

Hydrologic Soil Group Unidentified *

* See Legend on Following Page

9,000 4,500 0 9,000 Feet

2,500 1,250 0 2,500 Meters

PACE

Figure 4.1a

WATERSHED WITH SOILS INFORMATION SANTA CLARA RIVER

LEGEND

HYDROLOGIC SOIL GROUPS AND SOIL TYPES

HYDROLOGIC SOIL GROUP A

Cajon loamy sand, 2 to 9 percent slopes
Gravel pits
Metz loam, 0 to 2 percent slopes
Metz loam, 2 to 5 percent slopes
Metz loamy sand, 2 to 9 percent slopes
Riverwash
Tujunga-Capistrano families association, 2 to 20 percent slopes
Tujunga-Pismo families association, 15 to 70 percent slopes

HYDROLOGIC SOIL GROUP B

Agua Dulce stony loam, 30 to 50 percent slopes
Anacapa sandy loam, 2 to 9 percent slopes
Anaverde loam, 15 to 30 percent slopes
Anaverde rocky loam, 30 to 50 percent slopes
Calcixerollic Xerochrepts-Calleguas family-Modesto family, moderately deep complex, 30 to 60 percent slopes
Cortina cobbly sandy loam, 2 to 9 percent slopes
Cortina sandy loam, 0 to 2 percent slopes
Cortina sandy loam, 2 to 9 percent slopes
Greenfield sandy loam, 0 to 2 percent slopes
Greenfield sandy loam, 2 to 9 percent slopes
Greenfield sandy loam, 9 to 15 percent slopes, eroded
Hanford coarse sandy loam, 0 to 2 percent slopes
Hanford coarse sandy loam, 2 to 9 percent slopes
Hanford coarse sandy loam, 9 to 15 percent slopes
Hanford family, 3 to 25 percent slopes
Hanford gravelly sandy loam, 2 to 9 percent slopes
Hanford sandy loam, 0 to 2 percent slopes
Hanford sandy loam, 2 to 9 percent slopes
Hanford sandy loam, calcareous variant, 2 to 9 percent slopes
Haploxerolls, warm-Vista family association, 2 to 30 percent slopes
Metz loamy sand, loamy substratum, 0 to 2 percent slope s
Mocho loam, 0 to 2 percent slopes
Mocho loam, 2 to 9 percent slopes
Oak Glen family, 2 to 35 percent slopes
Oak Glen gravelly sandy loam, 2 to 9 percent slopes
Oak Glen loam, 0 to 2 percent slopes
Oak Glen loam, 2 to 9 percent slopes
Oak Glen sandy loam, 0 to 2 percent slopes
Oak Glen sandy loam, 2 to 9 percent slopes
Oak Glen-Tollhouse families complex, 30 to 70 percent slopes
Ojai loam, 2 to 9 percent slopes
Ojai loam, 9 to 15 percent slopes
Ojai loam, 15 to 30 percent slopes
Ojai loam, 30 to 50 percent slopes
Ojai loam, 30 to 50 percent slopes, eroded
Ojai loam, thin surface variant, 30 to 50 percent slopes
Ojai-Zamora loams, 15 to 30 percent slopes
Olete-Kilburn-Etsel families complex, 50 to 80 percent slopes
Ramona coarse sandy loam, 2 to 5 percent slopes
Ramona coarse sandy loam, 9 to 15 percent slopes
Ramona gravelly sandy loam, 2 to 9 percent slopes
Ramona gravelly sandy loam, 9 to 30 percent slopes
Ramona loam, 2 to 5 percent slopes
Ramona loam, 5 to 9 percent slopes
Ramona sandy loam, 9 to 30 percent slopes, eroded
San Benito clay loam, 9 to 15 percent slopes, eroded
Sandy alluvial land
Saugus loam, 15 to 30 percent slopes
Saugus loam, 30 to 50 percent slopes
Saugus loam, 30 to 50 percent slopes, eroded
Sorrento loam, 0 to 2 percent slopes
Sorrento loam, 2 to 9 percent slopes
Trigo family-Calcixerollic Xerochrepts-Vista family complex, 30 to 70 percent slopes
Vernalis clay loam, 0 to 2 percent slopes
Vernalis loam, 2 to 5 percent slopes
Vista coarse sandy loam, 9 to 15 percent slopes, eroded
Vista coarse sandy loam, 15 to 30 percent slopes
Vista coarse sandy loam, 15 to 30 percent slopes, eroded
Vista coarse sandy loam, 30 to 50 percent slopes
Vista coarse sandy loam, 30 to 50 percent slopes, eroded
Vista family, 5 to 30 percent slopes
Wyman cobbly loam, 5 to 9 percent slopes
Wyman gravelly loam, 2 to 9 percent slopes
Wyman gravelly loam, 9 to 15 percent slopes
Yolo loam, 0 to 2 percent slopes
Yolo loam, 2 to 9 percent slopes
Zamora clay loam, 2 to 9 percent slopes
Zamora loam, 2 to 9 percent slopes
Zamora loam, 9 to 15 percent slopes

HYDROLOGIC SOIL GROUP C

Caperton-Baywood families complex, 45 to 80 percent slopes
Caperton-Capistrano families complex, 35 to 80 percent slopes
Caperton-San Andreas-Modesto families complex, 15 to 60 percent slopes
Caperton-Trigo, granitic substratum-Lodo families complex, 50 to 85 percent slopes
Castaic and Saugus soils, 30 to 65 percent slopes, severely eroded
Castaic and Saugus soils, 30 to 75 percent slopes, erod ed
Castaic silty clay loam, 2 to 9 percent slopes
Castaic silty clay loam, 9 to 15 percent slopes
Castaic-Balcom complex, 30 to 50 percent slopes, eroded
Castaic-Balcom complex, 50 to 65 percent slopes, eroded
Castaic-Balcom silty clay loams, 30 to 50 percent slopes
Castaic-Balcom silty clay loams, 30 to 50 percent slopes, eroded
Castaic-Balcom silty clay loams, 50 to 65 percent slopes, eroded
Chilao family, 20 to 60 percent slopes
Chilao-Trigo, granitic substratum-Lodo families complex, 55 to 85 percent slopes
Chino loam
Gazos clay loam, 30 to 50 percent slopes
Gazos silty clay loam, 15 to 30 percent slopes
Gazos silty clay loam, 30 to 50 percent slopes
Haploxerolls, shallow-Trigo family, dry-Haploxeralfs complex, 90 percent slopes
Haploxerols, shallow-Lithic Xerorthents, warm complex, 45 to 75 percent slopes
Las Posas loam, 9 to 30 percent slopes
Las Posas-Toomes rocky loams, 30 to 50 percent slopes
Modesto, moderately deep-Trigo families complex, 25 to 75 percent slopes
Mollic Haploxeralfs, 2 to 50 percent slopes
Osito-Trigo families complex, 25 to 55 percent slopes
Pacifico family-Xerothents complex, 50 to 90 percent slopes
Pacifico-Preston families complex, 15 to 50 percent slopes
Pismo-Chilao-Shortcut families complex, 45 to 80 percent slopes
Rincon silty clay loam, 2 to 9 percent slopes
Trigo, granitic substratum-Pismo families complex, 20 to 60 percent slopes
Trigo-Lodo families-Haploxerolls, warm complex, 50 to 90 percent slopes
Trigo-Millsholm families-Rock outcrop complex, 45 to 90 percent slopes
Trigo-Modesto-San Andreas families association, 15 to 70 percent slopes
Typic Haploxeralfs, 3 to 50 percent slopes
Vista-Trigo, granitic substratum-Modesto families complex, 40 to 70 percent slopes

HYDROLOGIC SOIL GROUP D

Amargosa rocky coarse sandy loam, 9 to 55 percent slopes, eroded
Badland
Cibo clay, 5 to 15 percent slopes
Cibo clay, 15 to 30 percent slopes
Exchequer family, 30 to 60 percent slopes
Friant fine sandy loam, 50 to 75 percent slopes
Gaviota rocky sandy loam, 15 to 30 percent slopes, eroded
Gaviota rocky sandy loam, 30 to 50 percent slopes, eroded
Gaviota sandy loam, 30 to 50 percent slopes
Godde loam, 15 to 30 percent slopes
Godde rocky loam, 30 to 50 percent slopes
Lodo family-Mollic Haploxeralfs association, 15 to 50 percent slopes
Lodo-Modesto families complex, 30 to 70 percent slopes
Lodo-Modjeska-Botella families association, 10 to 70 percent slopes
Lodo-Tujunga families association, 2 to 50 percent slopes
Lopez shaly clay loam, 30 to 50 percent slopes
Millsholm loam, 30 to 50 percent slopes
Millsholm rocky loam, 15 to 30 percent slopes, eroded
Millsholm rocky loam, 30 to 50 percent slopes, eroded
Pismo family-Rock outcrop complex, 50 to 80 percent slopes
Pismo-Trigo, dry-Exchequer, dry families complex, 30 to 70 percent slopes
Riverwash
Rock land
Rock outcrop
Rock outcrop-Chilao family-Haploxerolls, warm association, 15 to 120 percent slopes
Stonyford-Millsholm families complex, 30 to 70 percent slopes
Temescal-Rock land complex, 30 to 50 percent slopes
Tollhouse-Knutsen-Stukel families complex, 30 to 70 percent slopes
Tollhouse-Stukel-Wrentham families complex, 60 to 90 percent slopes
Trigo, granitic substratum-Exchequer families-Rock outcrop complex, 30 to 60 percent slopes
Trigo, granitic substratum-Exchequer families-Rock outcrop complex, 60 to 100 percent slopes
Trigo-Calleguas families-Haploxeralfs complex, 30 to 70 percent slopes
Trigo-Calleguas families-Rock outcrop complex, 60 to 100 percent slopes
Vertic Xerochrepts, 5 to 50 percent slopes
Waterman-Springdale-Pacifico families complex, 30 to 70 percent slopes
Xerorthents-Urban land-Saugus complex, 15 to 30 percent slopes

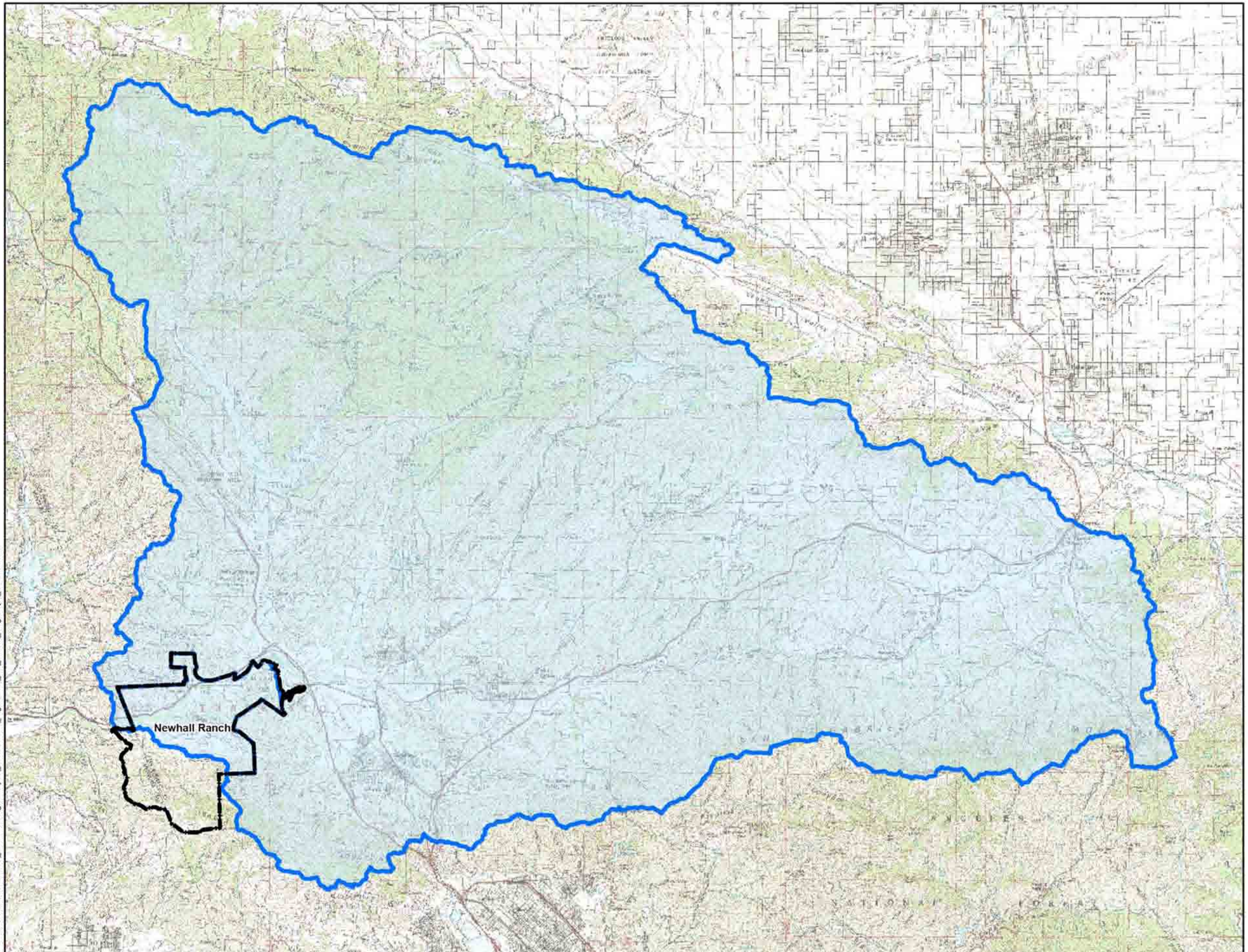
HYDROLOGIC SOIL GROUP UNIDENTIFIED

DAM
Rough broken land
Terrace escarpments
Water

Figure 4.1b

WATERSHED WITH SOILS INFORMATION LEGEND SANTA CLARA RIVER

FILE: \\pacefs01\swprojects\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2007\7104E_scr-watershed_soils_names_pc051007.mxd



NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

Newhall Ranch Specific Plan Boundary
Watershed Boundary

Feet: 9,000 4,500 0 9,000
Meters: 2,500 1,250 0 2,500

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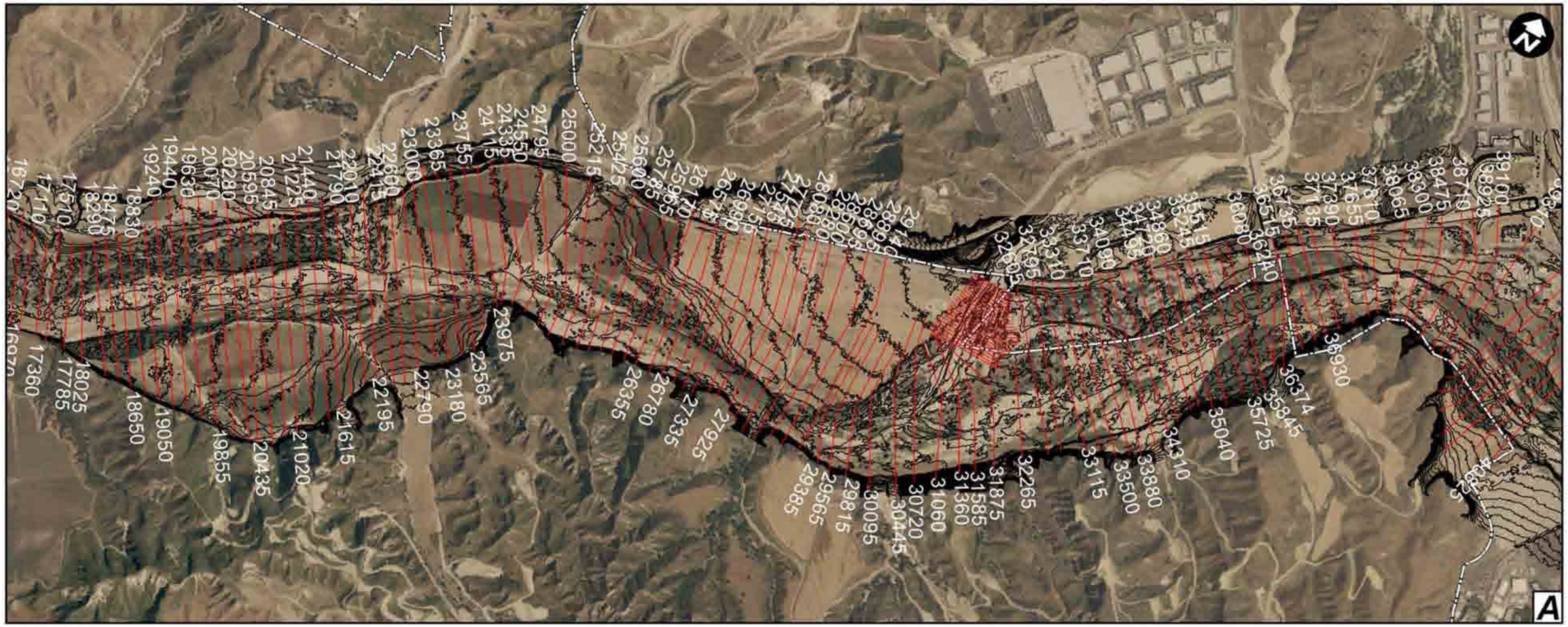
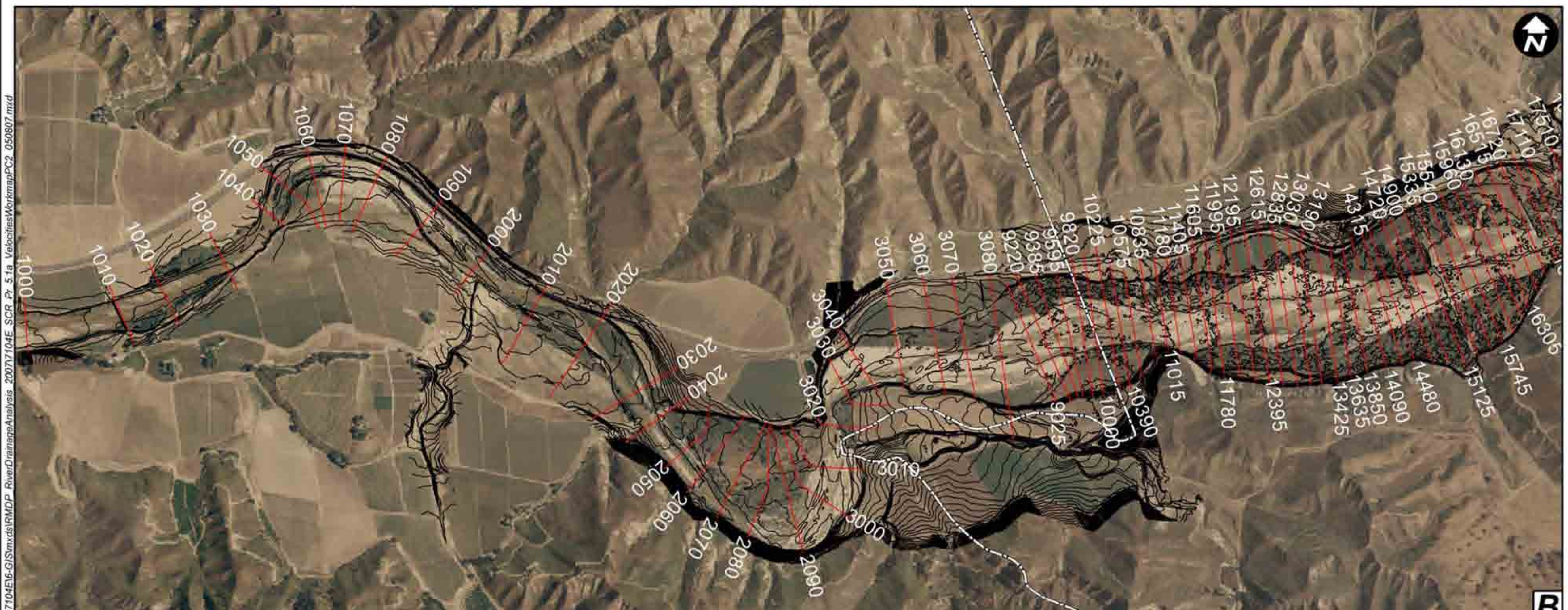
Figure 4.2

WATERSHED FEATURES
USGS TOPOGRAPHY
SANTA CLARA RIVER



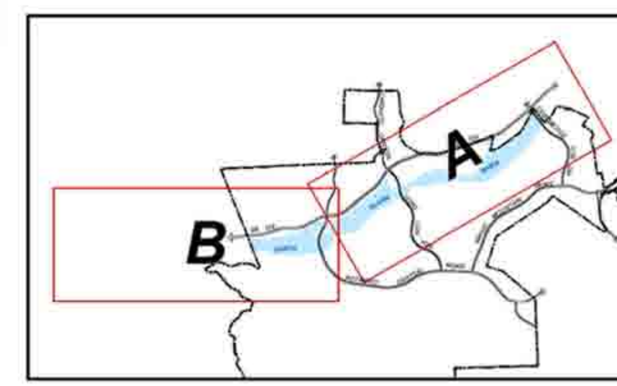


NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

Newhall Ranch Specific Plan Boundary

Cross Sections



Feet: 800 400 0 800
Meters: 250 125 0 250

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Figure 5.1a

EXISTING PRECONDITION VELOCITIES WORKMAP SANTA CLARA RIVER

P:\1704E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2007\1704E_SCR_Fr_5.1a_VelocitiesWorkmapPC2_050807.mxd

P:\1704E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\1704E_Figure-5-1b_scr_ex_2Yr_112108.mxd

NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

Newhall Ranch Specific Plan Boundary

10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39

Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

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Figure 5.1b

EXISTING PRECONDITION
2 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

NEWHALL LAND
A LENNAR/LNR COMPANY

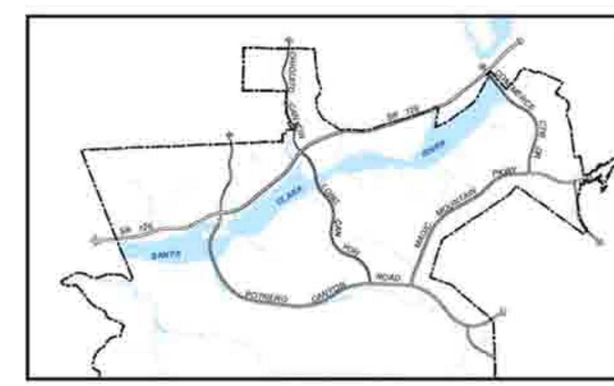
L E G E N D

Newhall Ranch Specific Plan Boundary

10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



1,750 875 0 1,750 Feet
500 250 0 500 Meters

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Figure 5.1c

EXISTING PRECONDITION
5 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-1c_scr_ex_5Yr_112108.mxd

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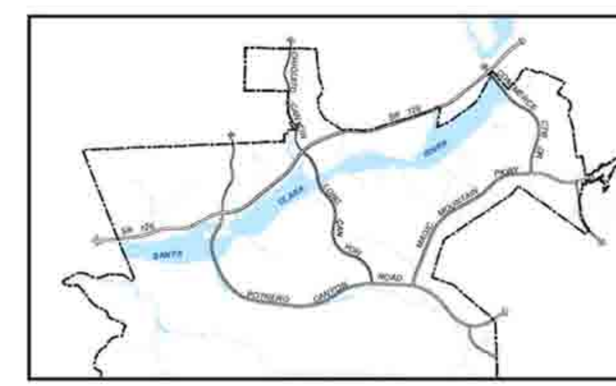
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

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Figure 5.1d

EXISTING PRECONDITION
10 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

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NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

Newhall Ranch Specific Plan Boundary

10875 Cross Sections

Velocity Profile (fps)

0 - 2
2 - 4
4 - 6
6 - 8
8 - 10
10 - 12
12 - 15
15 - 18
18 - 21
21 - 24
24 - 27
27 - 30
30 - 39

Feet
1,750 875 0 1,750
Meters
500 250 0 500

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Figure 5.1e

**EXISTING PRECONDITION\
20 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER**

NEWHALL LAND
A LENNAR/LNR COMPANY

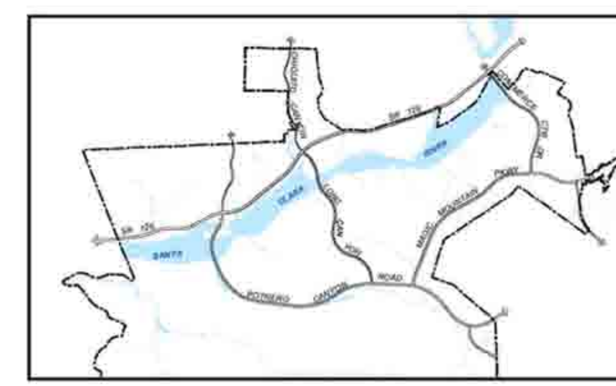
L E G E N D

Newhall Ranch Specific Plan Boundary

10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

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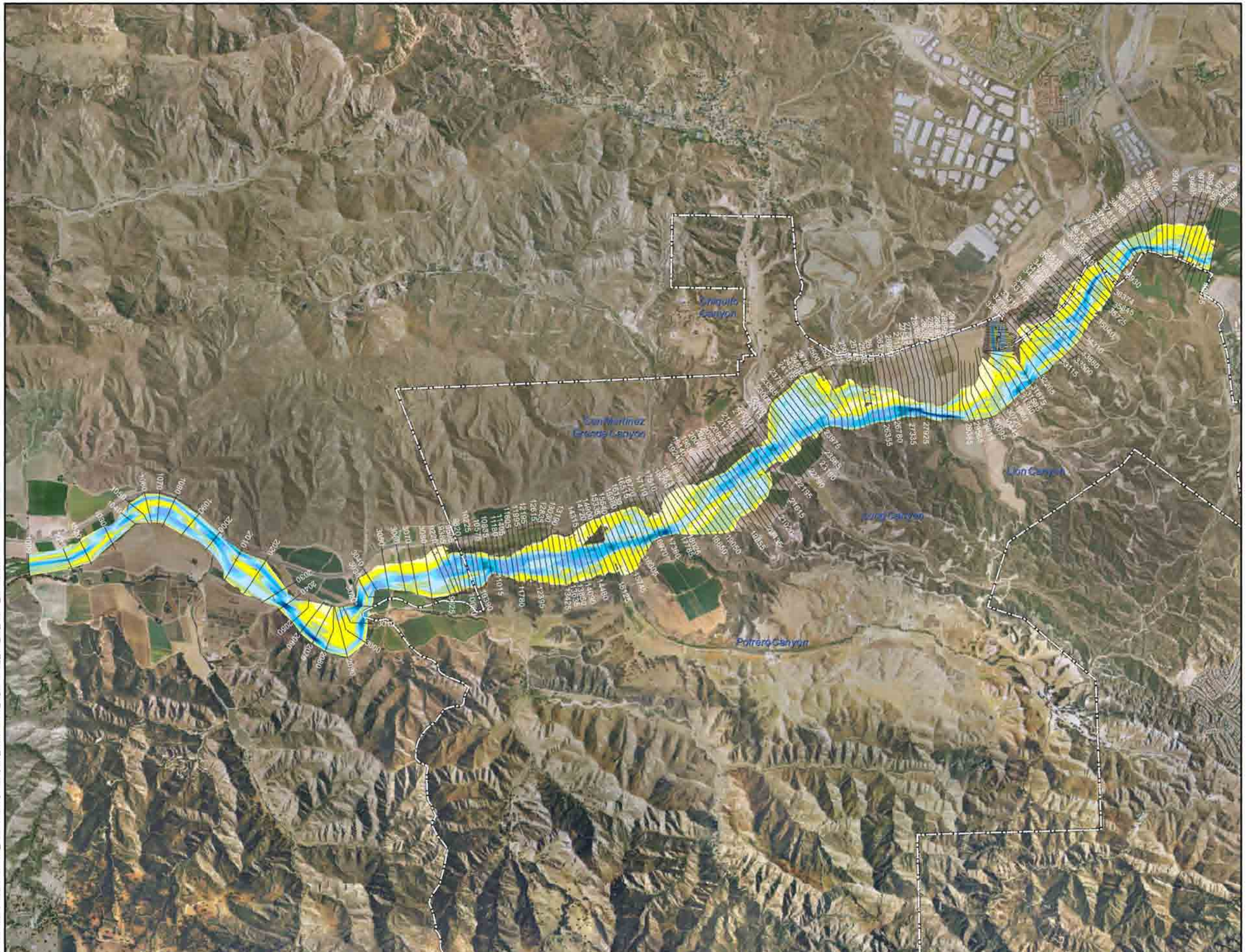
Figure 5.1f

**EXISTING PRECONDITION\
50 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER**

P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-1f_scr_ex_50Yr_112108.mxd



NEWHALL LAND
A LENNAR/LNR COMPANY

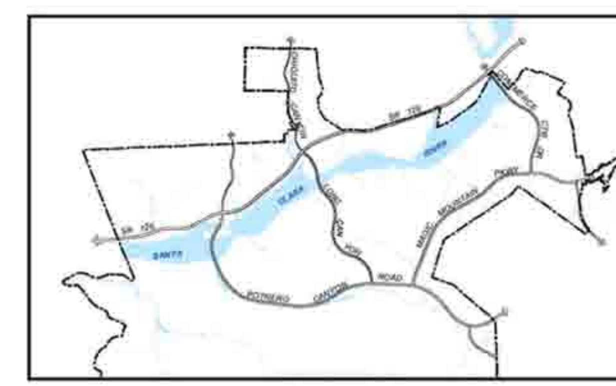
L E G E N D

Newhall Ranch Specific Plan Boundary

10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

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Figure 5.1g

**EXISTING PRECONDITION\
100 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER**

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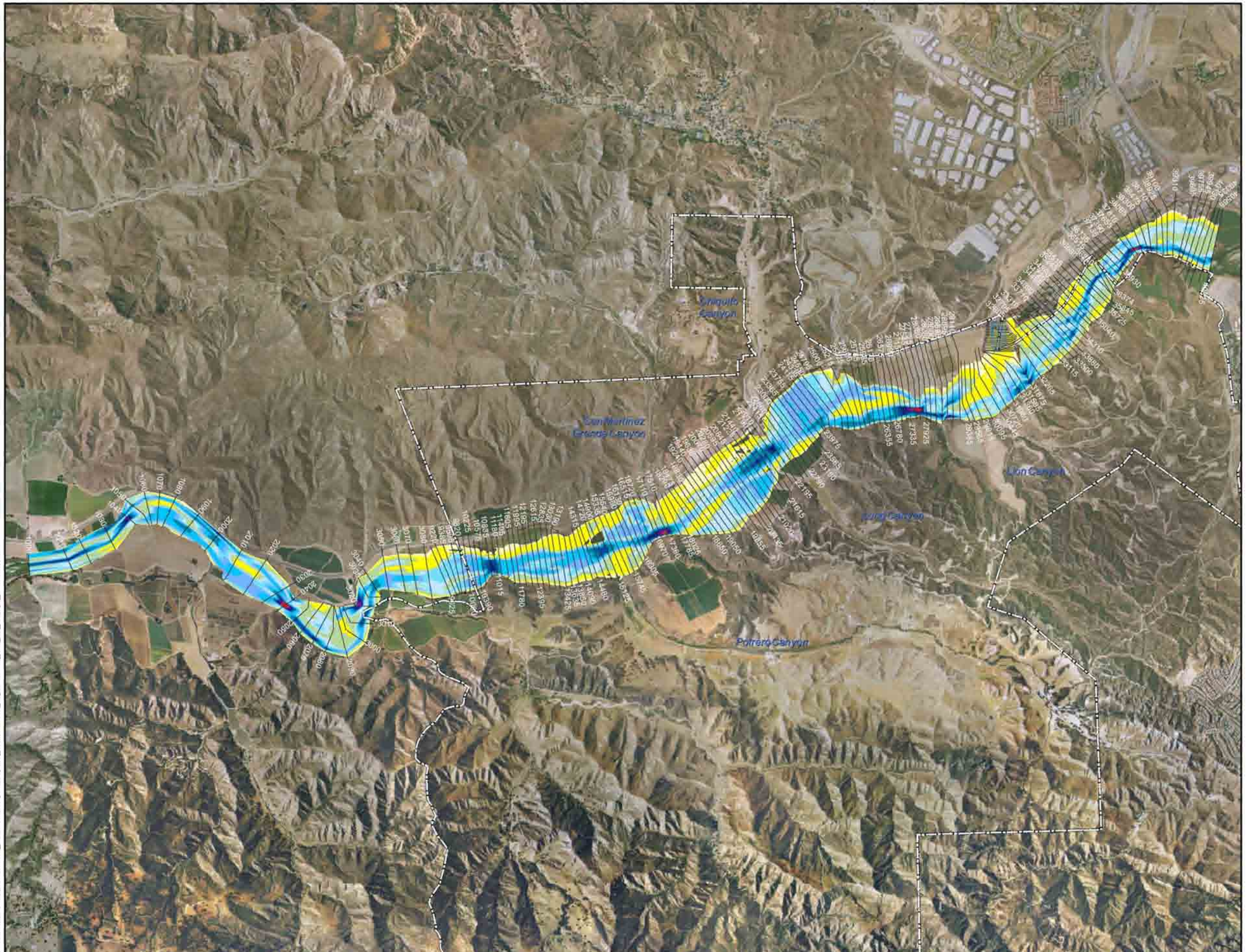


NEWHALL LAND
A LENNAR/LNR COMPANY

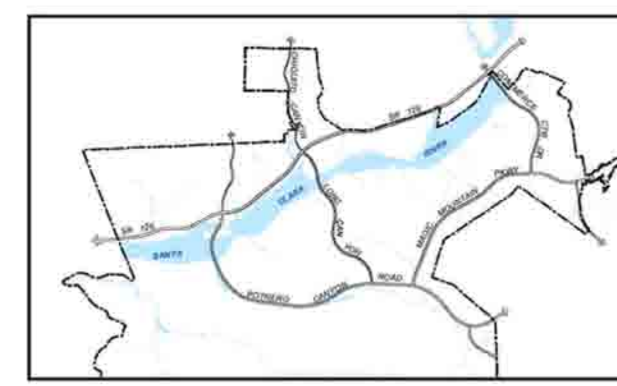
L E G E N D

Newhall Ranch Specific Plan Boundary

10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



1,750 875 0 1,750 Feet
500 250 0 500 Meters

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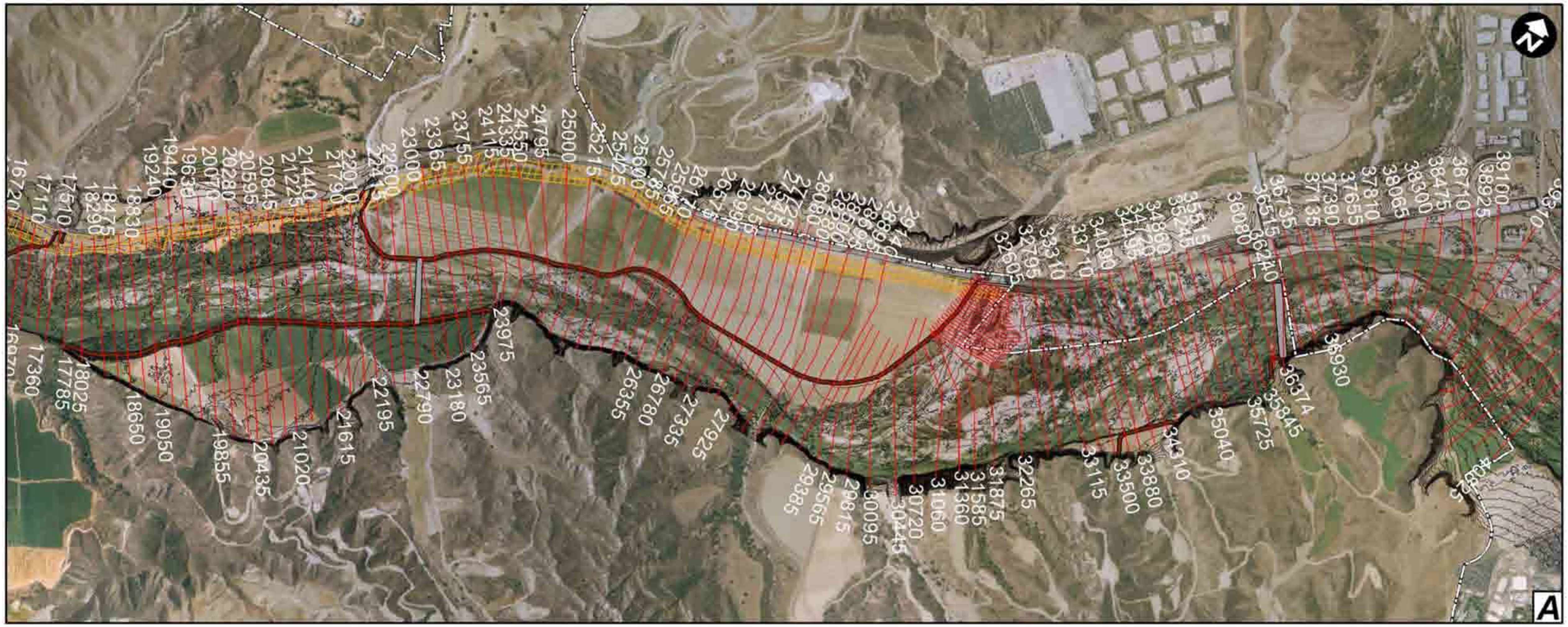
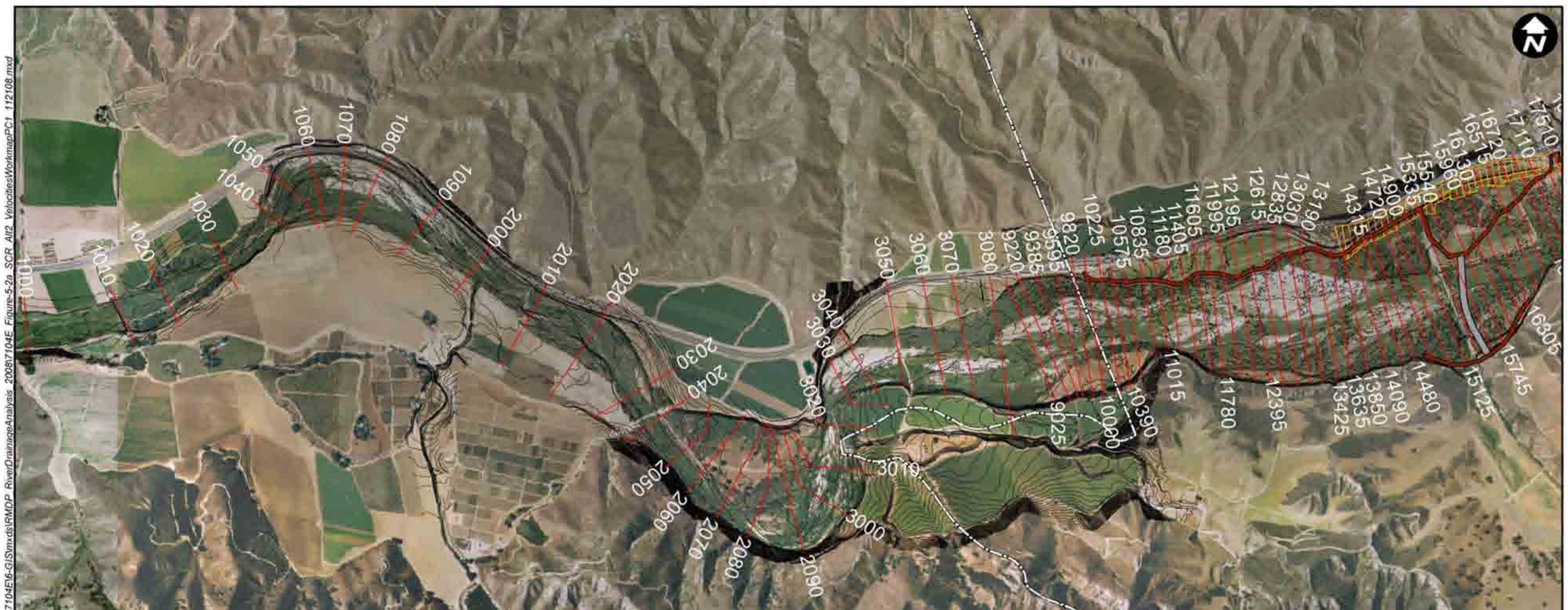
Figure 5.1h

EXISTING PRECONDITION
CAPITAL FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\1704E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\1704E_Figure-5-1h_scr_ex_CAPyr_112108.mxd

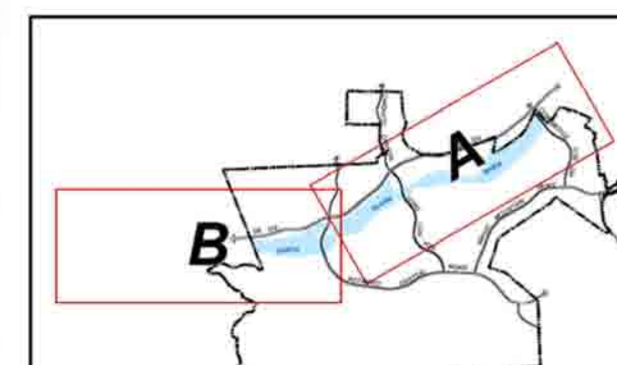
NEWHALL LAND
A LENNAR/LNR COMPANY





L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Bridge Locations
- Utility Corridor
- Cross Sections



Feet: 1,750 875 0 1,750

Meters: 500 250 0 500

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Figure 5.2a

ALTERNATIVE 2 (PROPOSED PROJECT)
VELOCITIES WORKMAP
SANTA CLARA RIVER

P:\1704E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\1704E_Figure-5-2a_SCR_Alt2_VelocitiesWorkmapPC1_112108.mxd

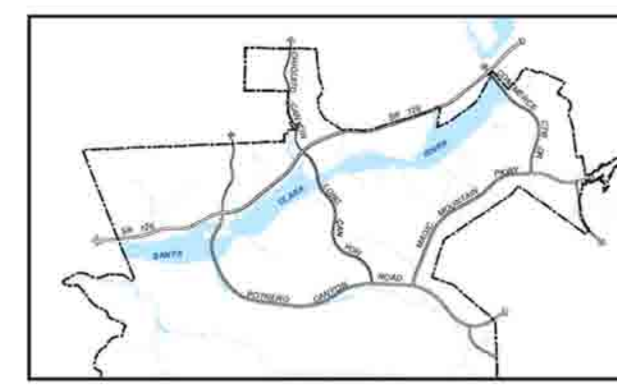
NEWHALL LAND
A LENNAR/LNR COMPANY

LEGEND

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

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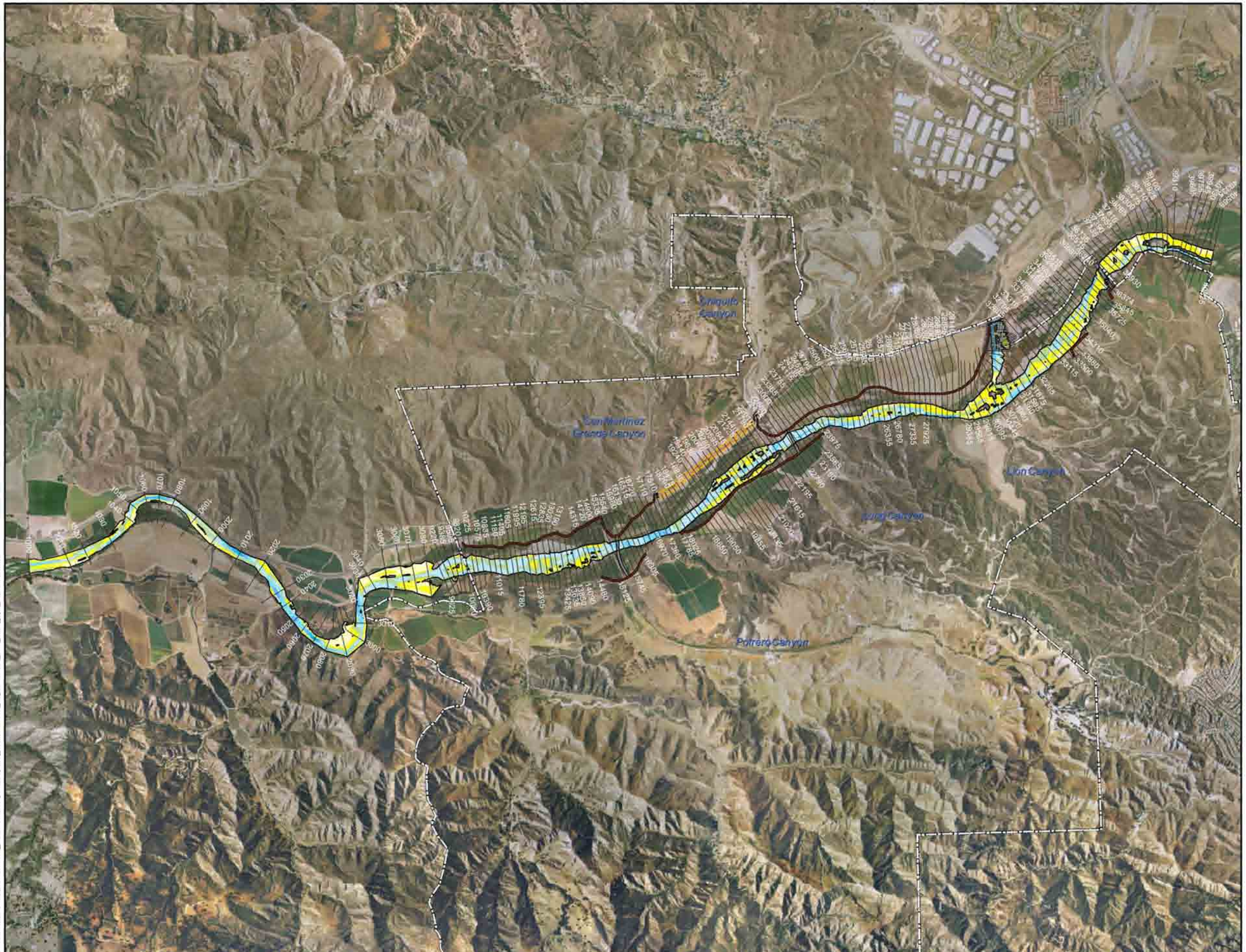
Figure 5.2b

ALTERNATIVE 2
2 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-2b_scr_Alt2_2yr_112108.mxd



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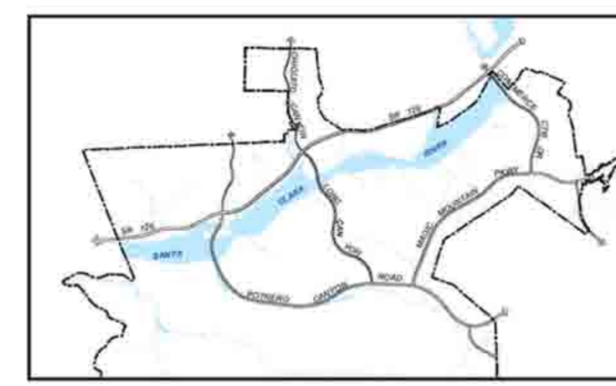
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



1,750 875 0 1,750 Feet
500 250 0 500 Meters

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Figure 5.2c

ALTERNATIVE 2
5 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-2d_scr_Alt2_10yr_112108.mxd

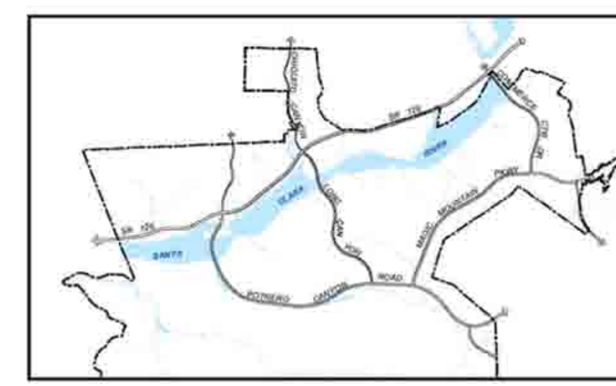
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

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Figure 5.2d

ALTERNATIVE 2
10 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

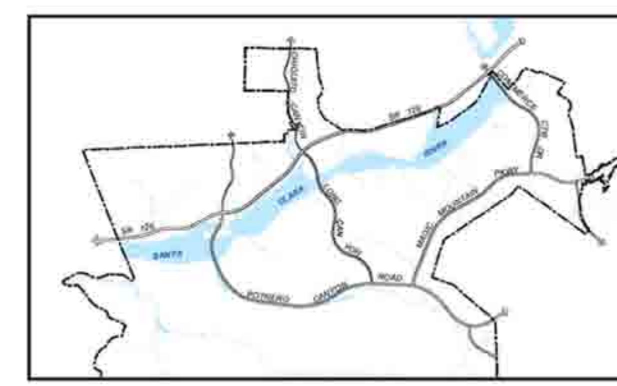
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



1,750 875 0 1,750 Feet
500 250 0 500 Meters

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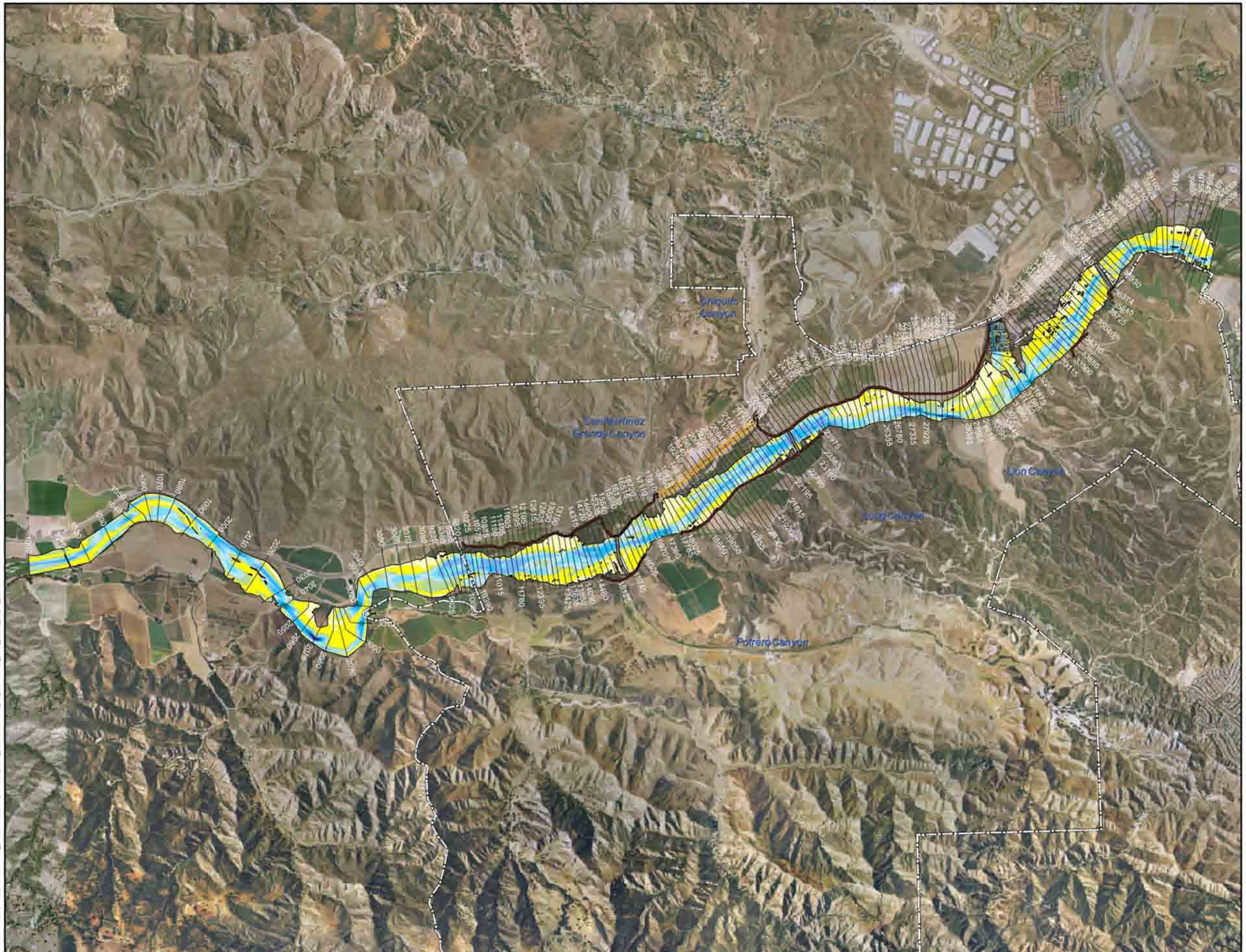
Figure 5.2e
ALTERNATIVE 2
20 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-2e_scr_Alt2_20yr_112108.mxd



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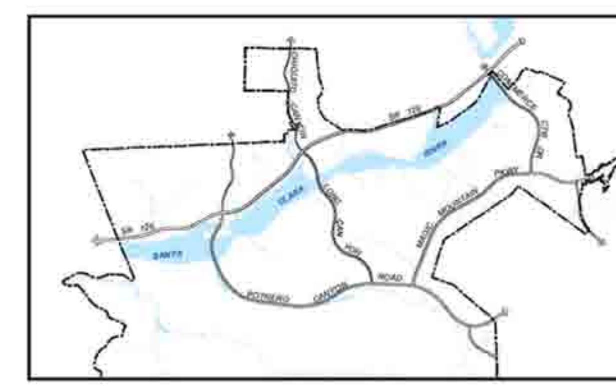
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



1,750 875 0 1,750 Feet
500 250 0 500 Meters

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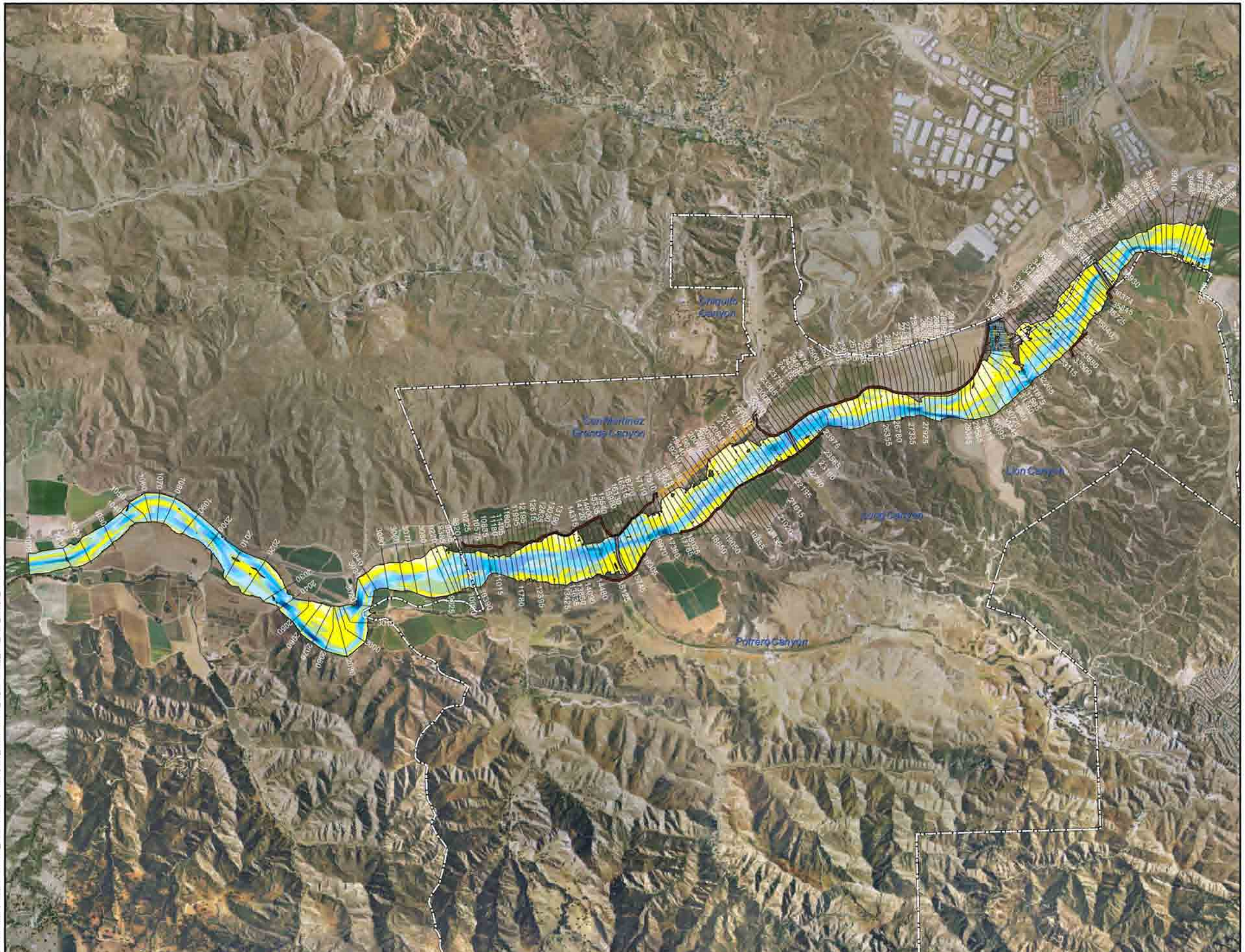
Figure 5.2f

ALTERNATIVE 2
50 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

NEWHALL LAND
A LENNAR/LNR COMPANY

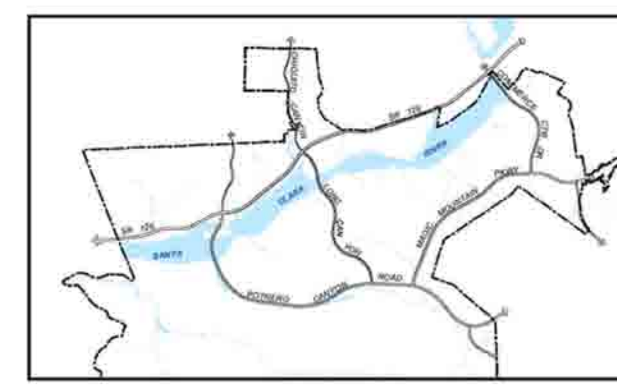


L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

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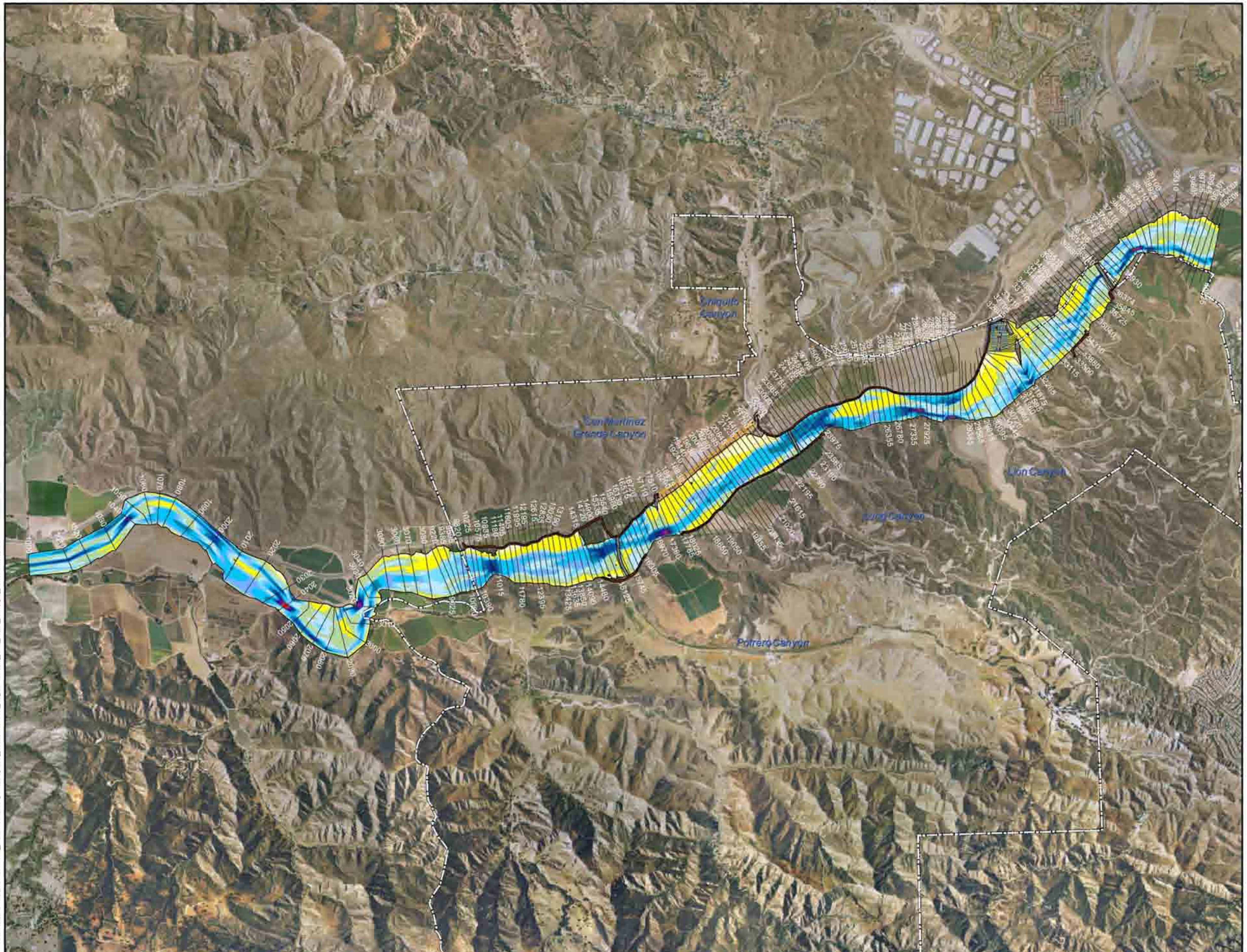
Figure 5.2g

ALTERNATIVE 2
100 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\1704E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\1704E_Figure-5-2g_scr_Alt2_100yr_112108.mxd

NEWHALL LAND
A LENNAR/LNR COMPANY



L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39

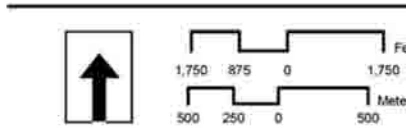


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Figure 5.2h

ALTERNATIVE 2
CAPITAL FLOOD EVENT VELOCITY
SANTA CLARA RIVER

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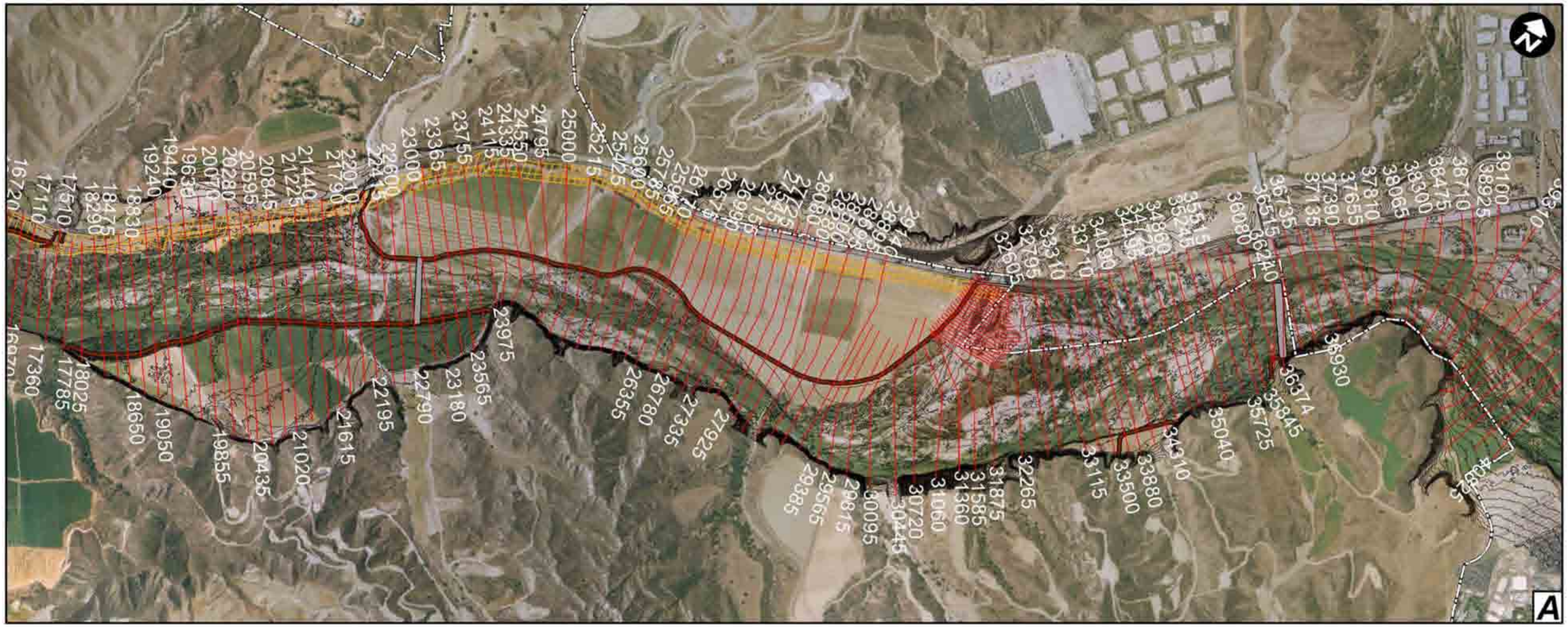
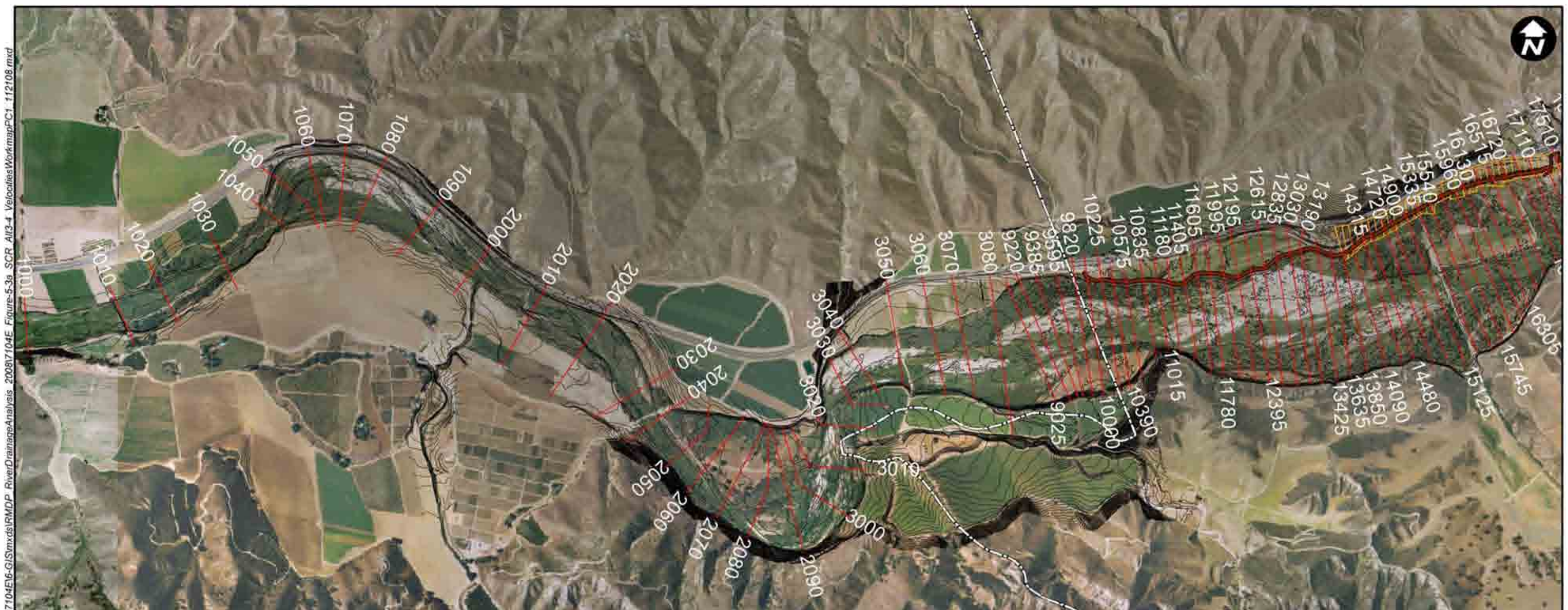
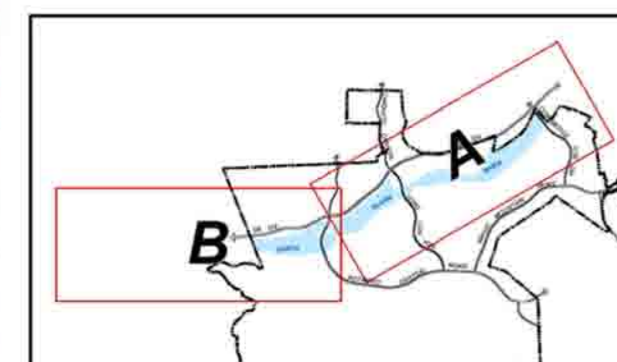
NEWHALL LAND
A LENNAR/LNR COMPANY



L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Bridge Locations
- Utility Corridor
- Cross Sections





1,750 875 0 1,750 Feet

500 250 0 500 Meters

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Figure 5.3a

ALTERNATIVE 3 & 4
VELOCITIES WORKMAP
SANTA CLARA RIVER

P:\1704E6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\1704E_Figure-5-3a_SCR_Alt3-4_VelocitiesWorkmapPC1_112108.mxd

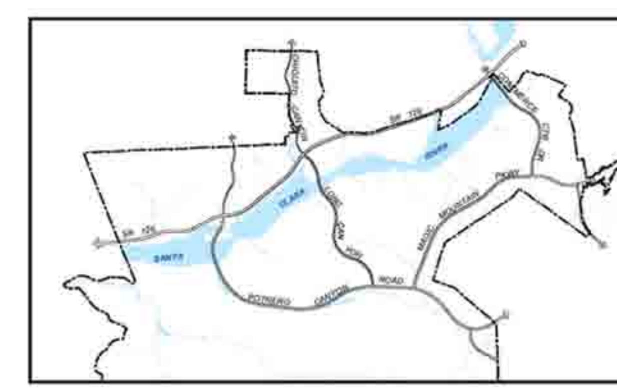
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



1,750 875 0 1,750 Feet
500 250 0 500 Meters

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Figure 5.3b

ALTERNATIVE 3 & 4
100 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-3b_scr_Alt3-4_2yr_112108.mxd

Figure 5.3c

ALTERNATIVE 3 & 4
5 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39

1,750 875 0 1,750 Feet
500 250 0 500 Meters

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Figure 5.3d

ALTERNATIVE 3 & 4
10 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-3d_scr_Alt3-4_10yr_112108.mxd

P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-3e_scr_Alt3-4_20yr_112108.mxd

NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
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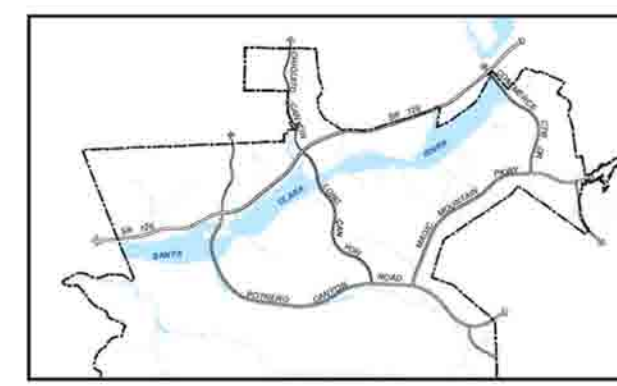
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



1,750 875 0 1,750 Feet
500 250 0 500 Meters

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Figure 5.3e

ALTERNATIVE 3 & 4
20 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

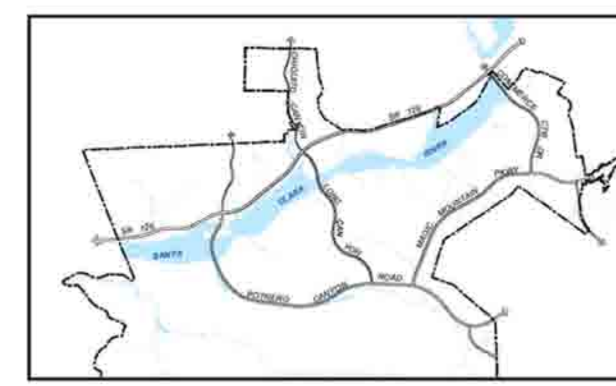
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



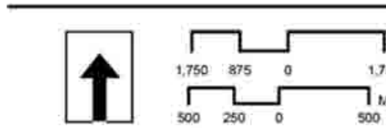


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Figure 5.3f

ALTERNATIVE 3 & 4
50 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-3f_scr_Alt3-4_50yr_112108.mxd

P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-3g_scr_Alt3-4_100yr_112108.mxd

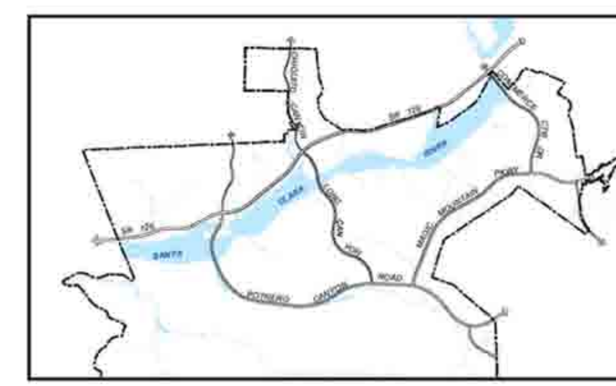
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

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Figure 5.3g

ALTERNATIVE 3 & 4
100 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

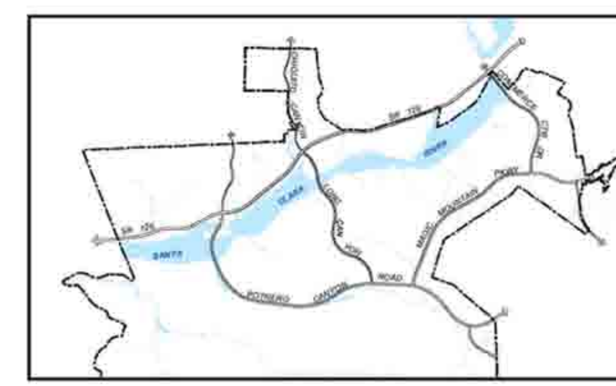
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



1,750 875 0 1,750 Feet
500 250 0 500 Meters

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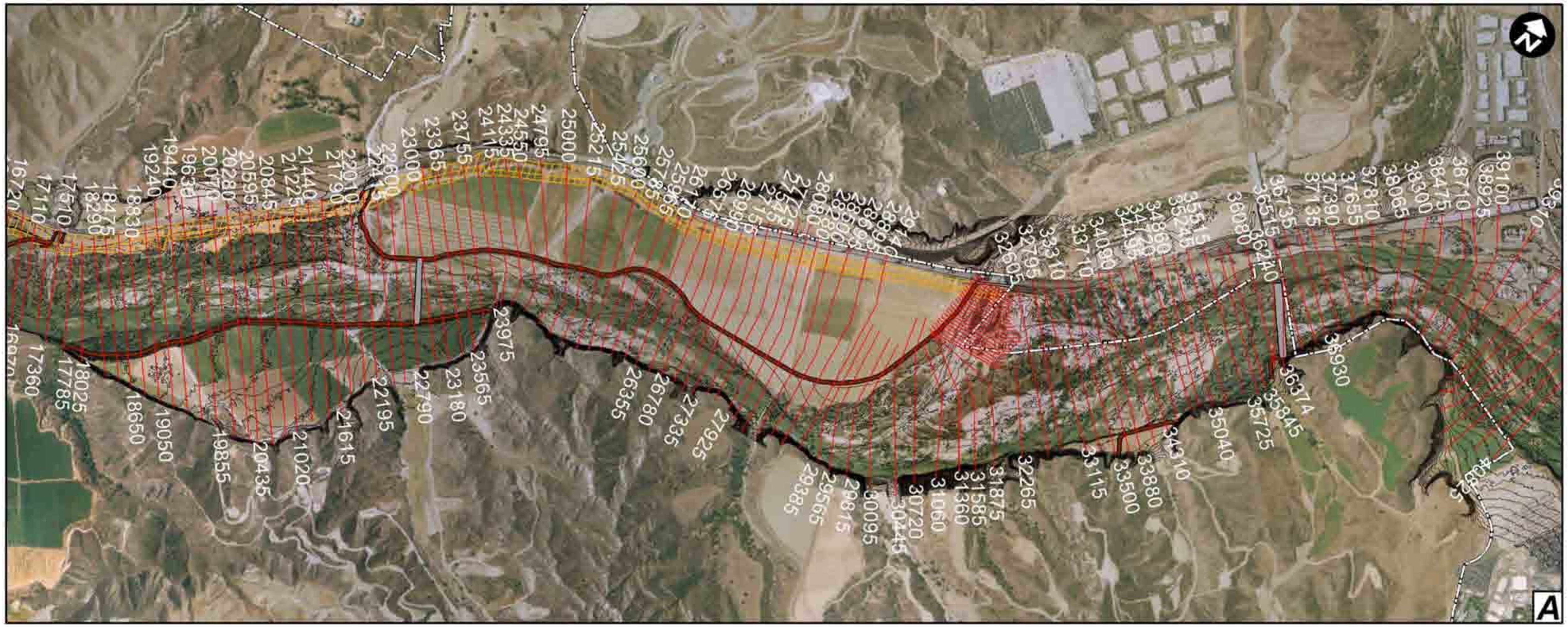
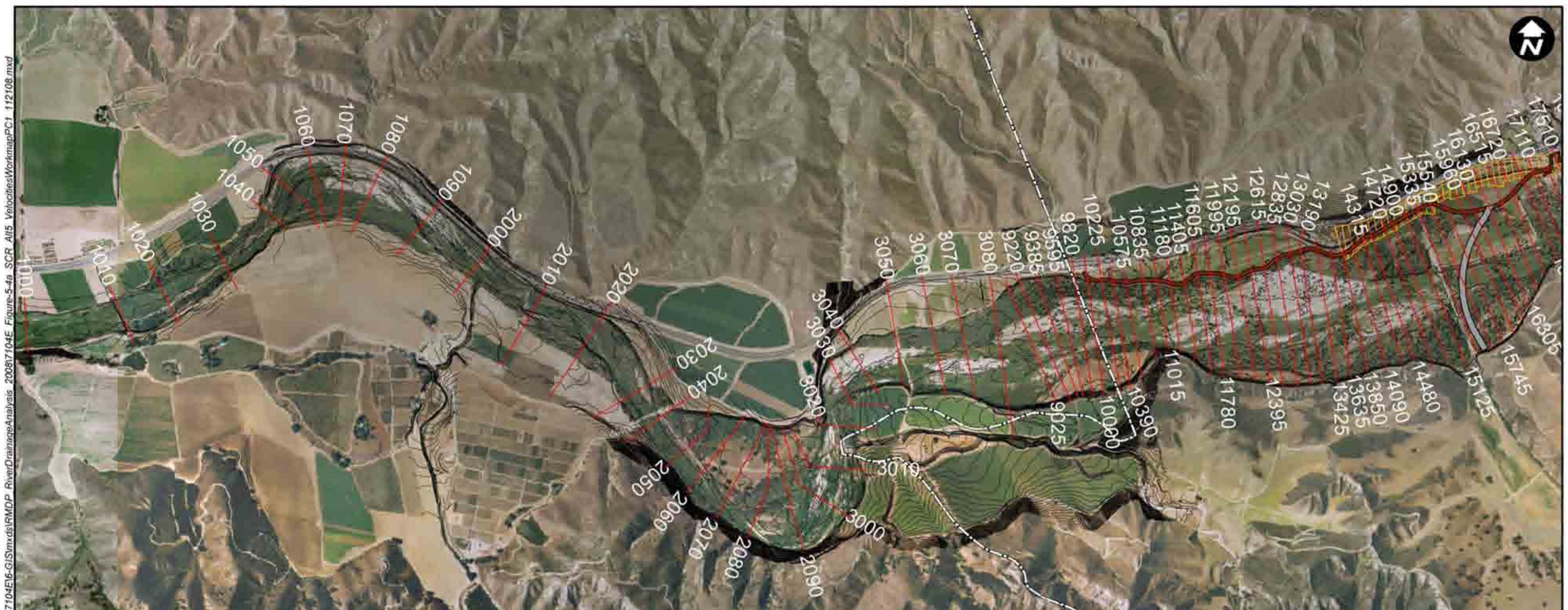
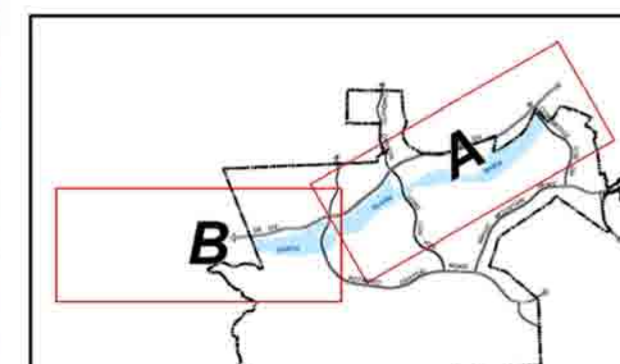
Figure 5.3h

ALTERNATIVE 3 & 4
CAPITAL FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-3h_scr_Alt3-4_CAPyr_112108.mxd







NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Bridge Locations
- Utility Corridor
- Cross Sections

1,750 875 0 1,750 Feet
500 250 0 500 Meters

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Figure 5.4a

ALTERNATIVE 5
VELOCITIES WORKMAP
SANTA CLARA RIVER

P:\1704E6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-4a_SCR_Alt5_VelocitiesWorkmapPC1_112108.mxd

NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39

1,750 875 0 1,750 Feet
500 250 0 500 Meters

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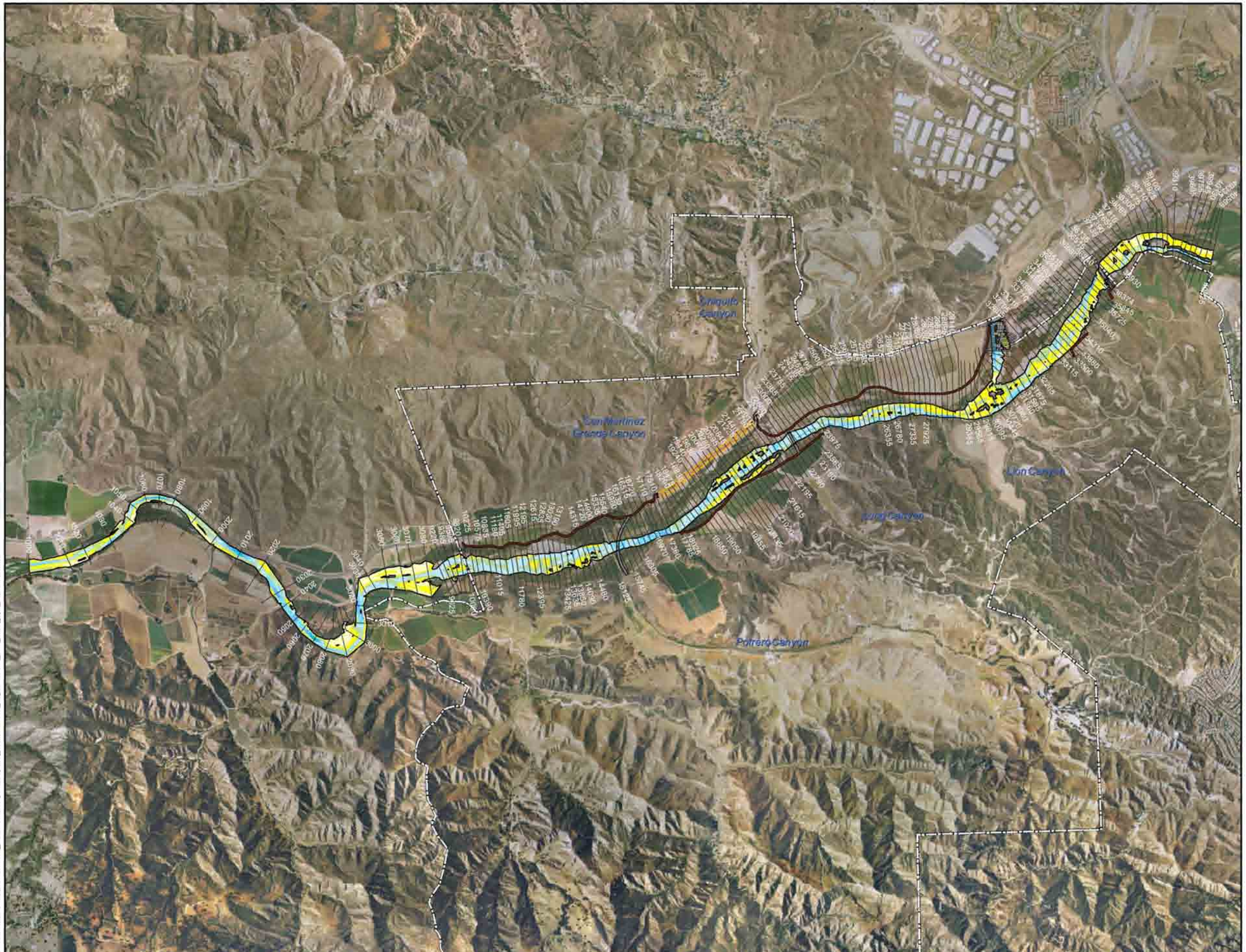
Figure 5.4b

ALTERNATIVE 5
2 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-4b_scr_Alt5_2yr_112108.mxd



NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

Newhall Ranch Specific Plan Boundary
Bank Stabilization
Utility Corridor
Bridge Locations
Cross Sections

Velocity Profile (fps)

0 - 2
2 - 4
4 - 6
6 - 8
8 - 10
10 - 12
12 - 15
15 - 18
18 - 21
21 - 24
24 - 27
27 - 30
30 - 39

Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

PACE

Figure 5.4c

ALTERNATIVE 5
5 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

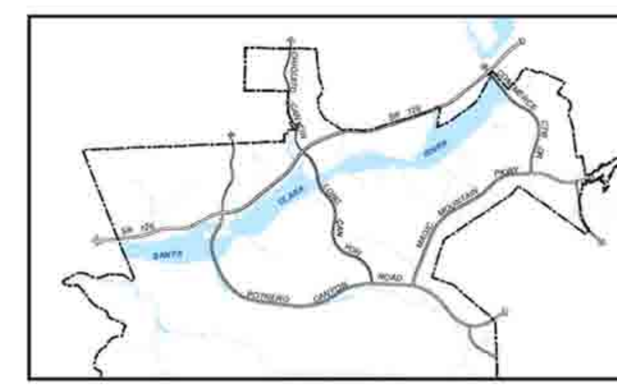
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

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Figure 5.4d
ALTERNATIVE 5
10 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

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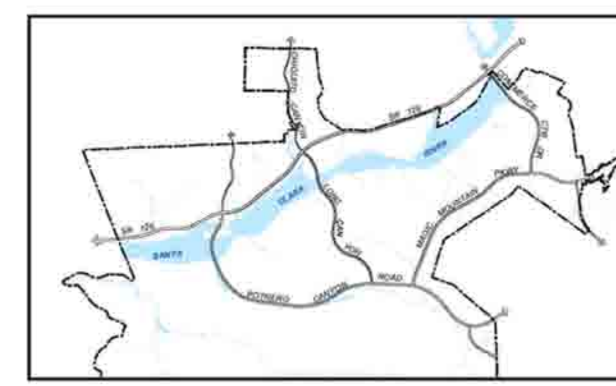
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

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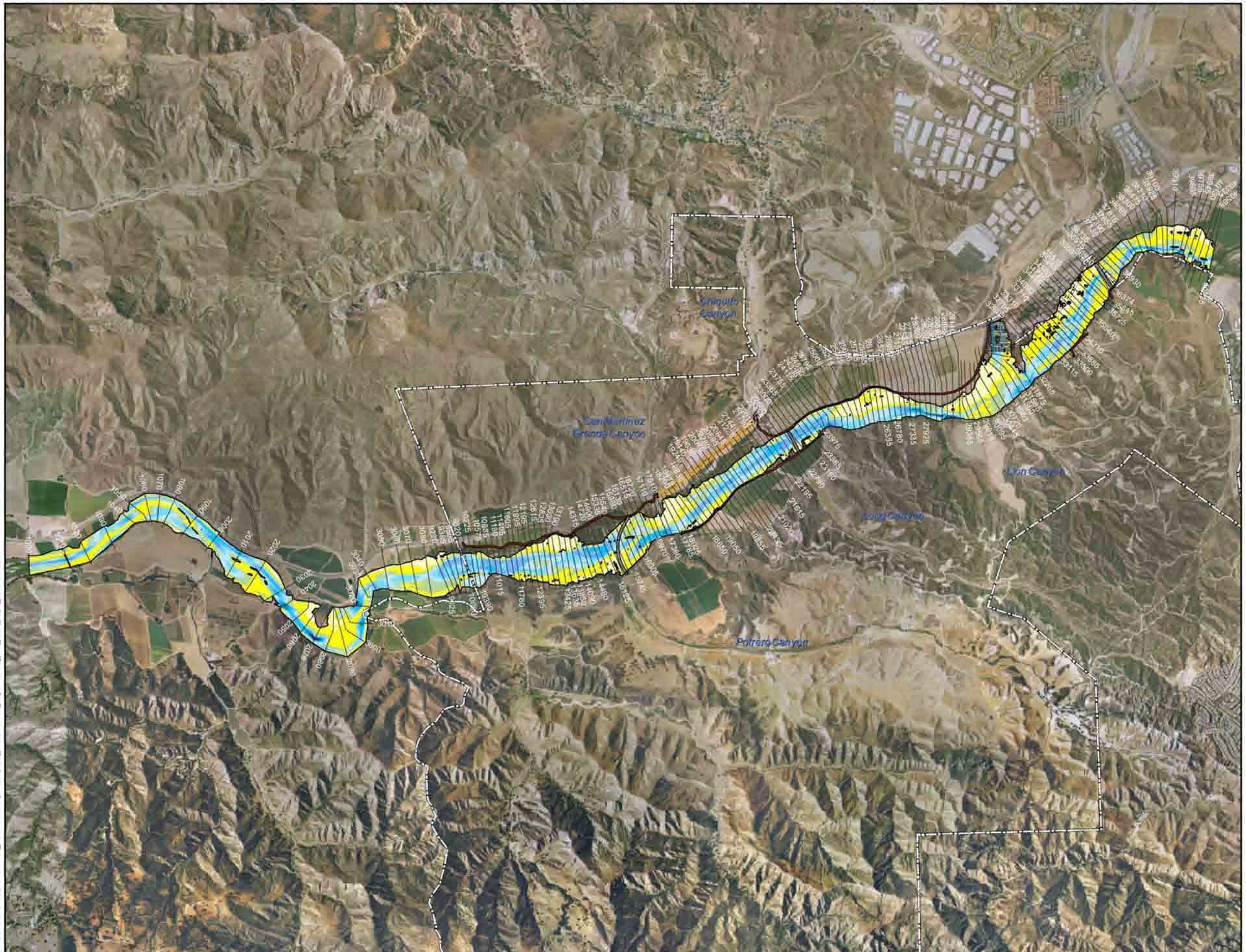
Figure 5.4e

ALTERNATIVE 5
20 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-4e_scr_Alt5_20yr_112108.mxd



P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-4f_scr_Alt5_50yr_112108.mxd

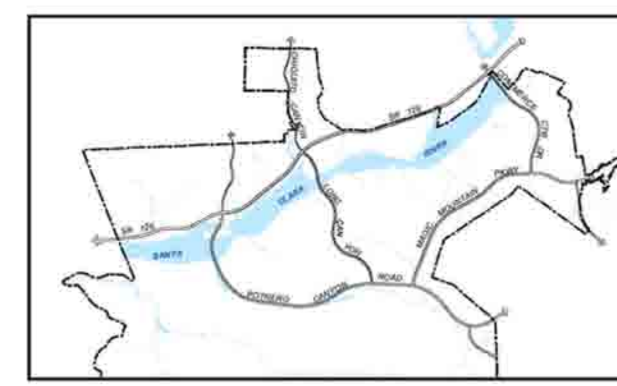
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

Newhall Ranch Specific Plan Boundary
Bank Stabilization
Utility Corridor
Bridge Locations
10875 Cross Sections

Velocity Profile (fps)

0 - 2
2 - 4
4 - 6
6 - 8
8 - 10
10 - 12
12 - 15
15 - 18
18 - 21
21 - 24
24 - 27
27 - 30
30 - 39



1,750 875 0 1,750 Feet
500 250 0 500 Meters

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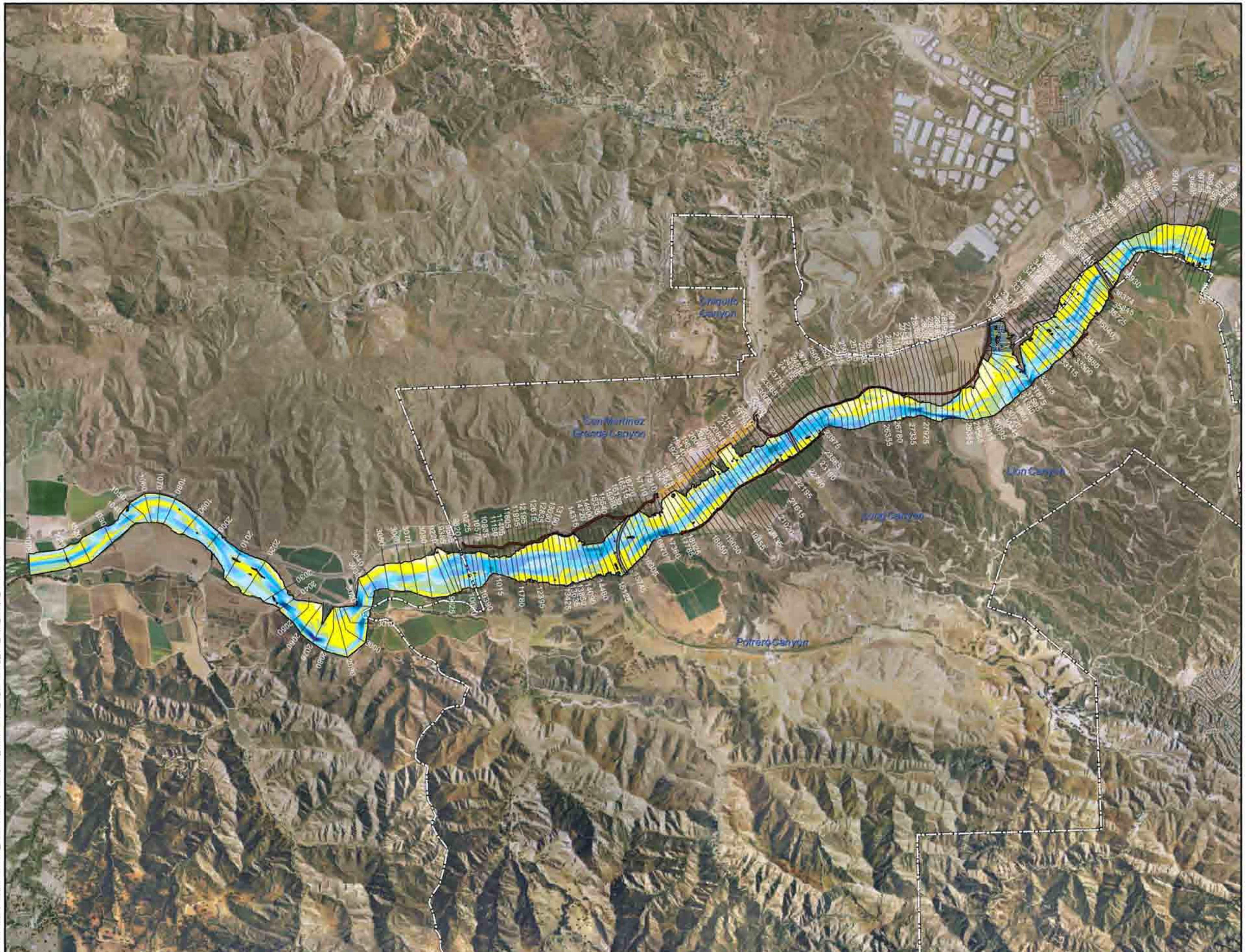
Figure 5.4f

ALTERNATIVE 5
50 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER



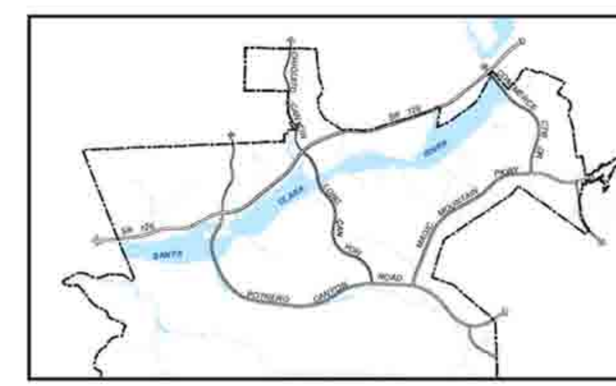
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

Newhall Ranch Specific Plan Boundary
Bank Stabilization
Utility Corridor
Bridge Locations
10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

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Figure 5.4g

ALTERNATIVE 5
100 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

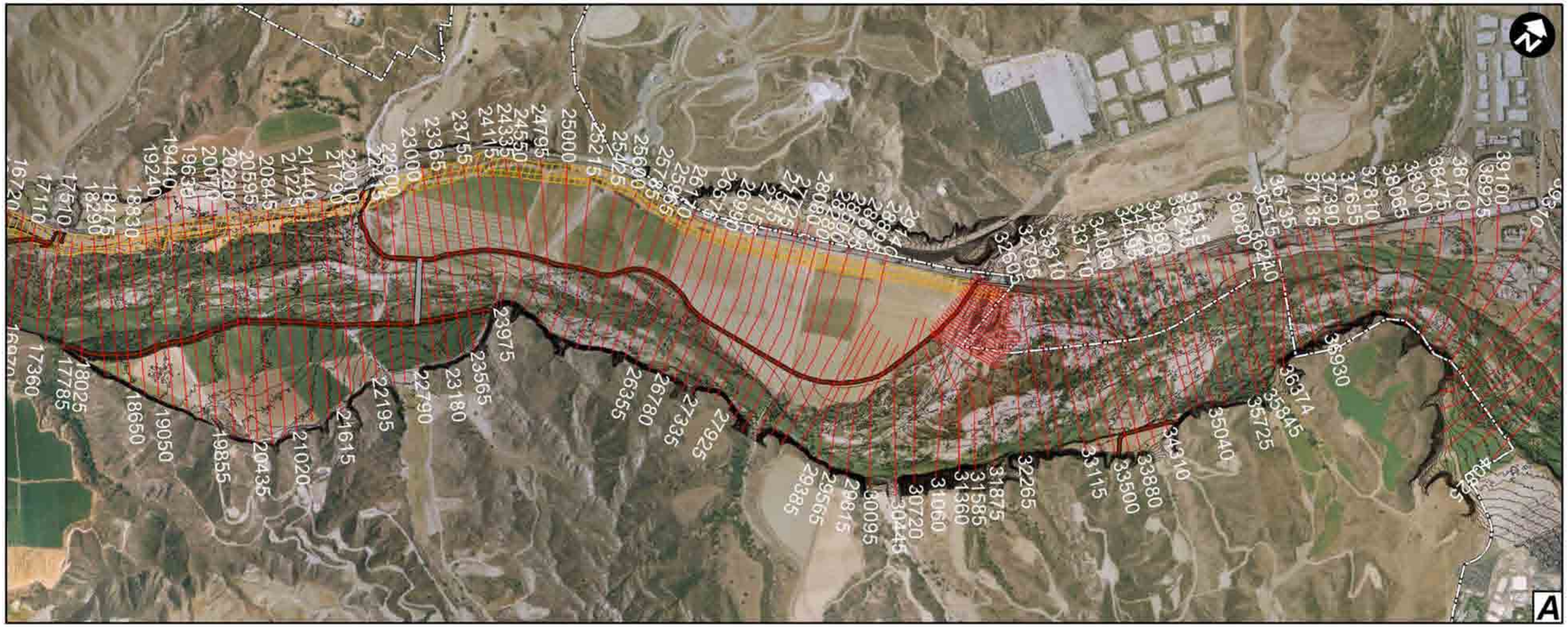
P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-4g_scr_Alt5_100yr_112108.mxd

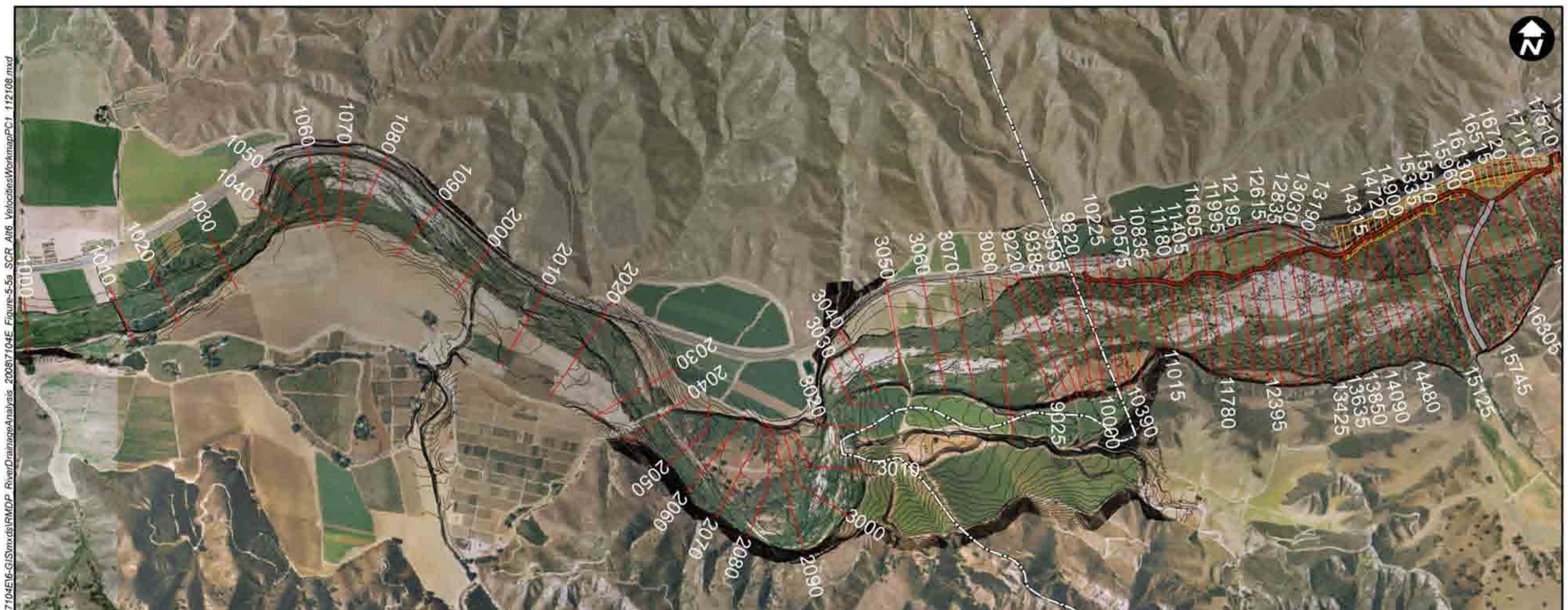
P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-4h_scr_Alt5_CAPyr_112108.mxd

Figure 5.4h

ALTERNATIVE 5
CAPITAL FLOOD EVENT VELOCITY
SANTA CLARA RIVER

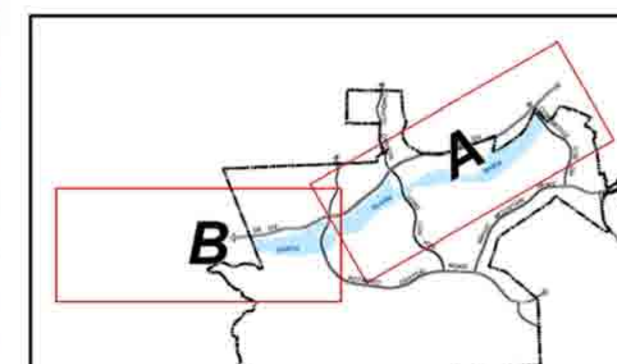
NEWHALL LAND
A LENNAR/LNR COMPANY





LEGEND

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Bridge Locations
- Utility Corridor
- Cross Sections



Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

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Figure 5.5a

ALTERNATIVE 6
VELOCITIES WORKMAP
SANTA CLARA RIVER

P:\1704E6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\1704E_Figure-5-5a_SCR_Alt6_VelocitiesWorkmapPC1_112108.mxd

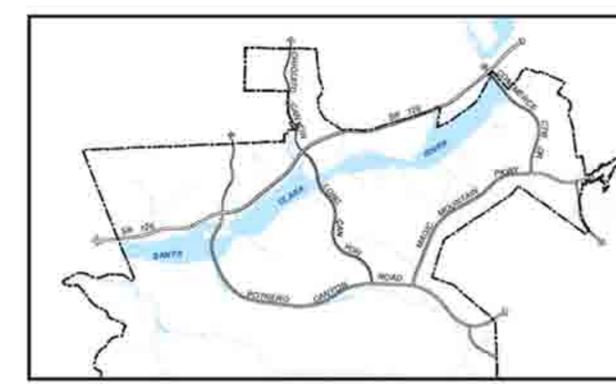
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



1,750 875 0 1,750 Feet
500 250 0 500 Meters

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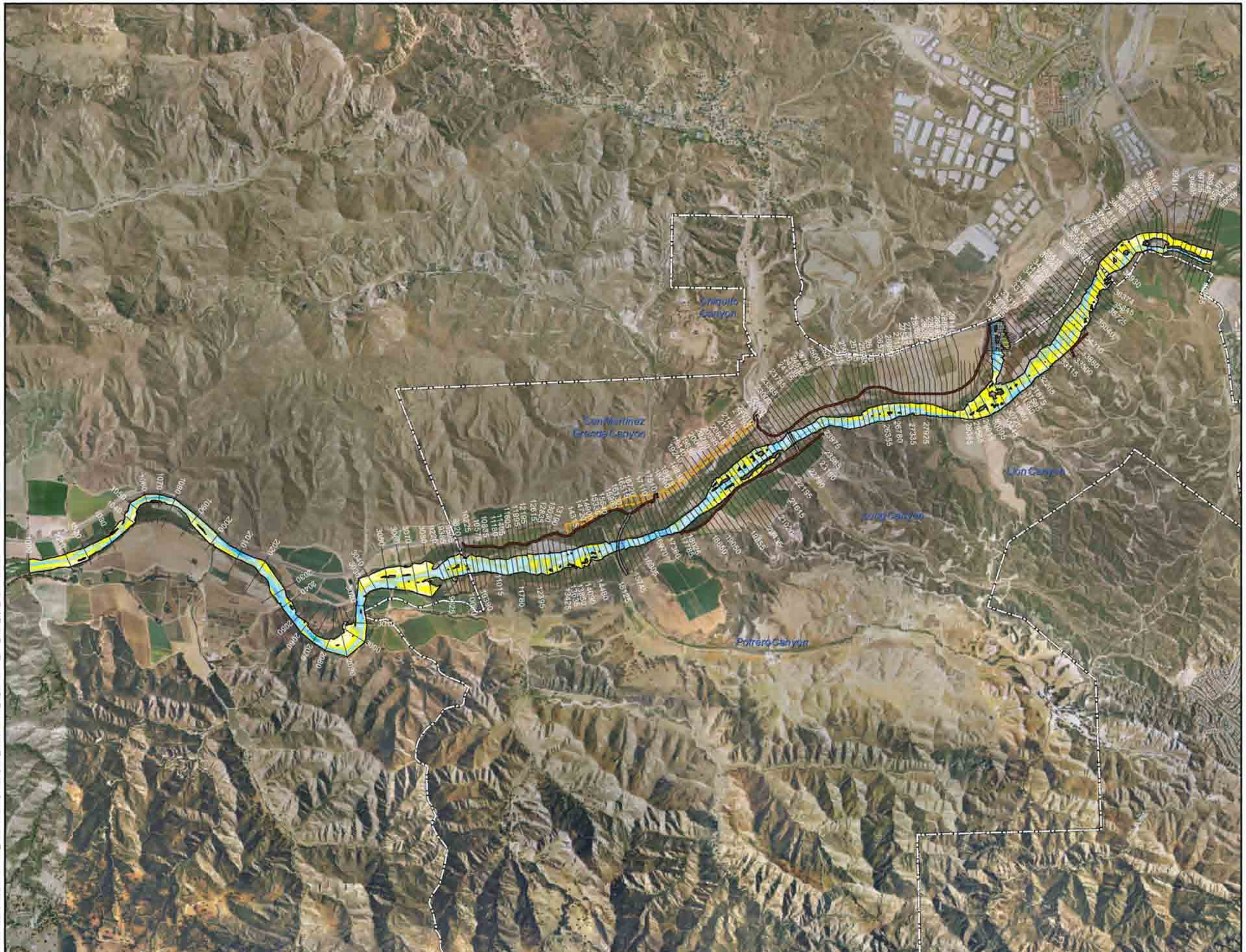
Figure 5.5b

ALTERNATIVE 6
2 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-5b_scr_Alt6_2yr_112108.mxd



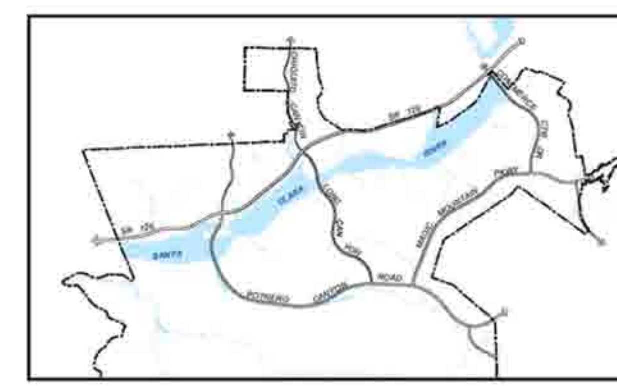
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



Feet
1,750 875 0 1,750
Meters
500 250 0 500

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Figure 5.5c

ALTERNATIVE 6
5 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-5c_scr_Alt6_5yr_112108.mxd

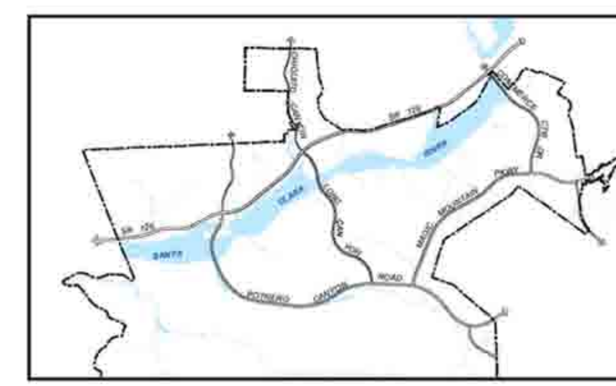
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

Newhall Ranch Specific Plan Boundary
Bank Stabilization
Utility Corridor
Bridge Locations
10875 Cross Sections

Velocity Profile (fps)

0 - 2
2 - 4
4 - 6
6 - 8
8 - 10
10 - 12
12 - 15
15 - 18
18 - 21
21 - 24
24 - 27
27 - 30
30 - 39



1,750 875 0 1,750 Feet
500 250 0 500 Meters

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Figure 5.5d

ALTERNATIVE 6
10 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-5d_scr_Alt6_10yr_112108.mxd

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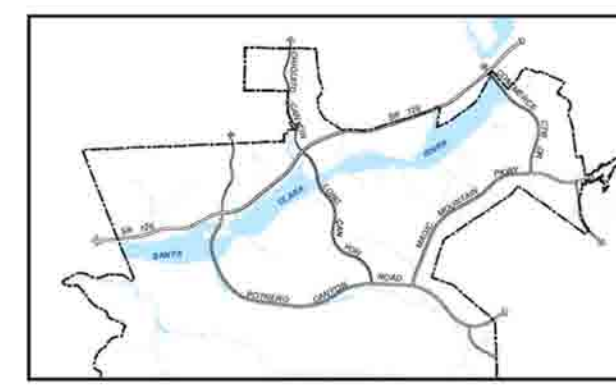
NEWHALL LAND
A LENNAR/LNR COMPANY

LEGEND

Newhall Ranch Specific Plan Boundary
Bank Stabilization
Utility Corridor
Bridge Locations
10875 Cross Sections

Velocity Profile (fps)

0 - 2
2 - 4
4 - 6
6 - 8
8 - 10
10 - 12
12 - 15
15 - 18
18 - 21
21 - 24
24 - 27
27 - 30
30 - 39



Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

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Figure 5.5e

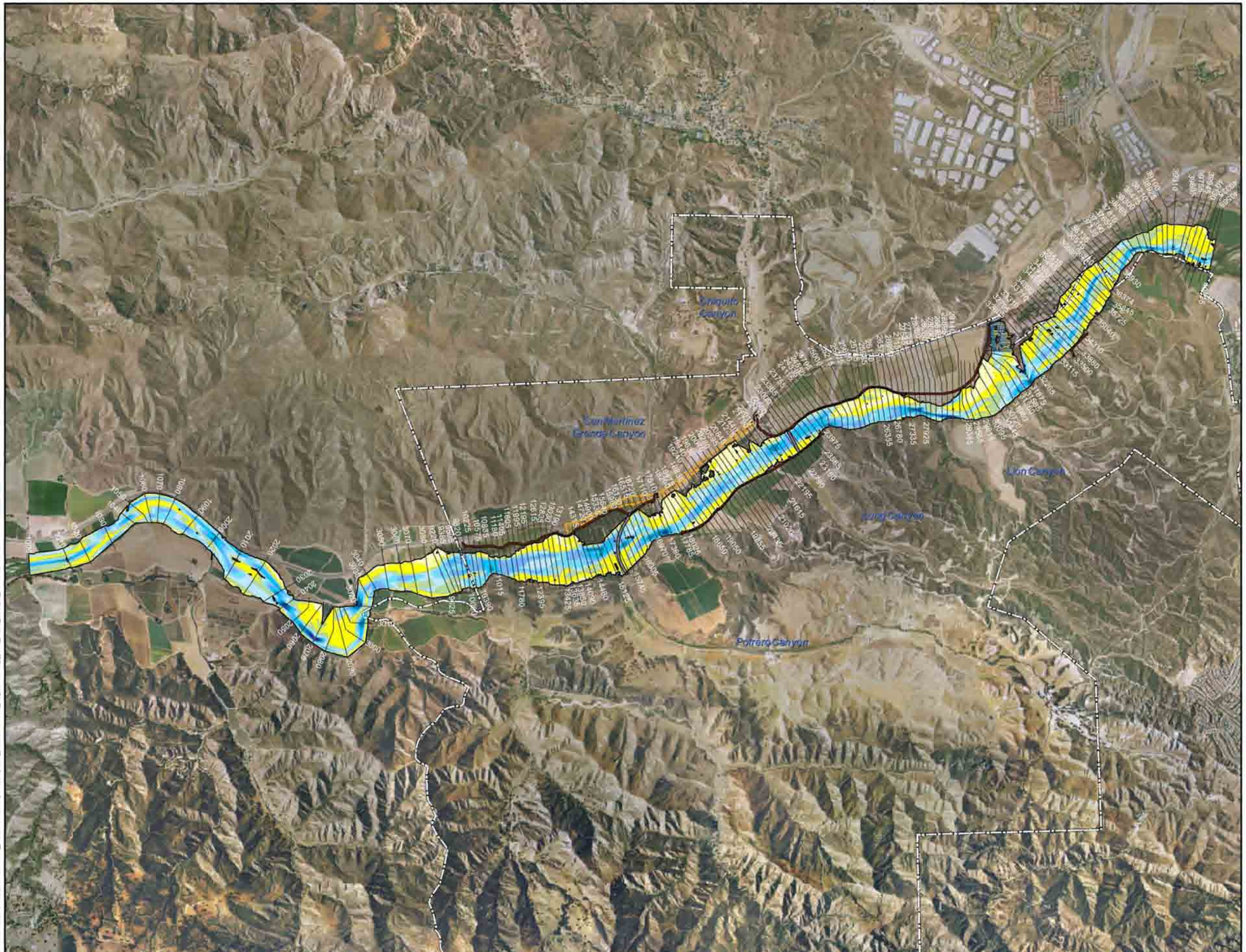
ALTERNATIVE 6
20 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

Figure 5.5f

ALTERNATIVE 6
50 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\1704E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\1704E_Figure-5-5f_scr_Alt6_50yr_112108.mxd

P:\1704E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\1704E_Figure-5-5g_scr_Alt6_100yr_112108.mxd



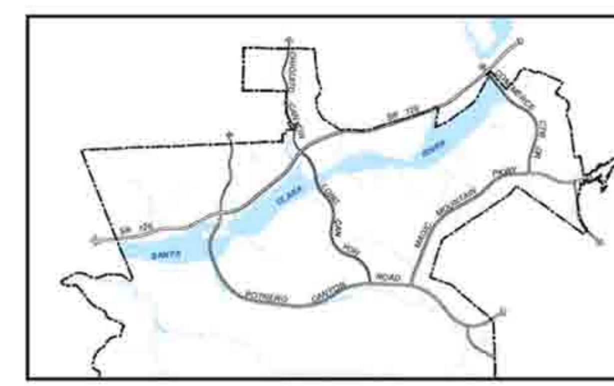
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



1,750 875 0 1,750 Feet
500 250 0 500 Meters

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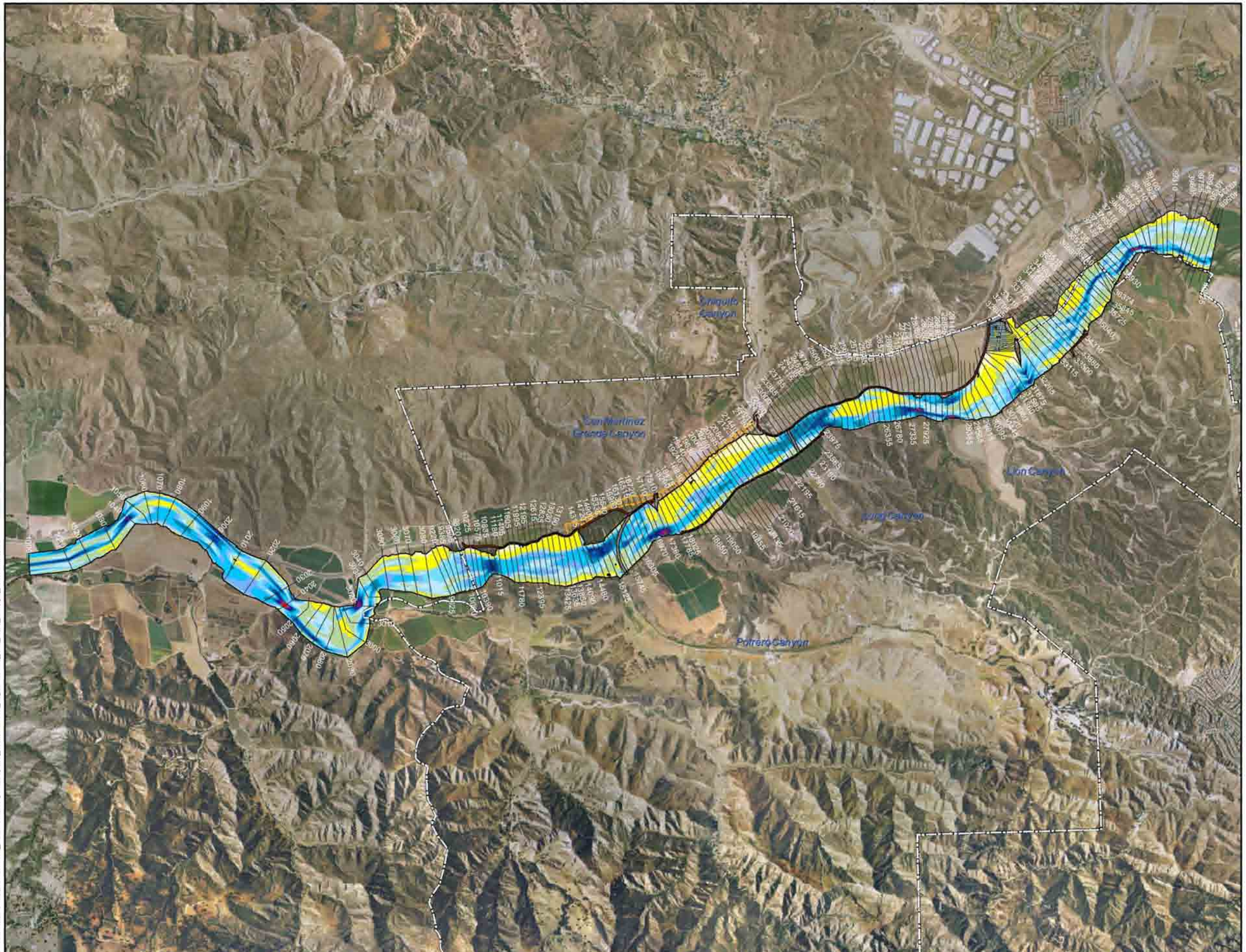
Figure 5.5g

ALTERNATIVE 6
100 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER



NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

Newhall Ranch Specific Plan Boundary
Bank Stabilization
Utility Corridor
Bridge Locations
Cross Sections

Velocity Profile (fps)

0 - 2
2 - 4
4 - 6
6 - 8
8 - 10
10 - 12
12 - 15
15 - 18
18 - 21
21 - 24
24 - 27
27 - 30
30 - 39

Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

PACE
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Figure 5.5h

ALTERNATIVE 6
CAPITAL FLOOD EVENT VELOCITY
SANTA CLARA RIVER

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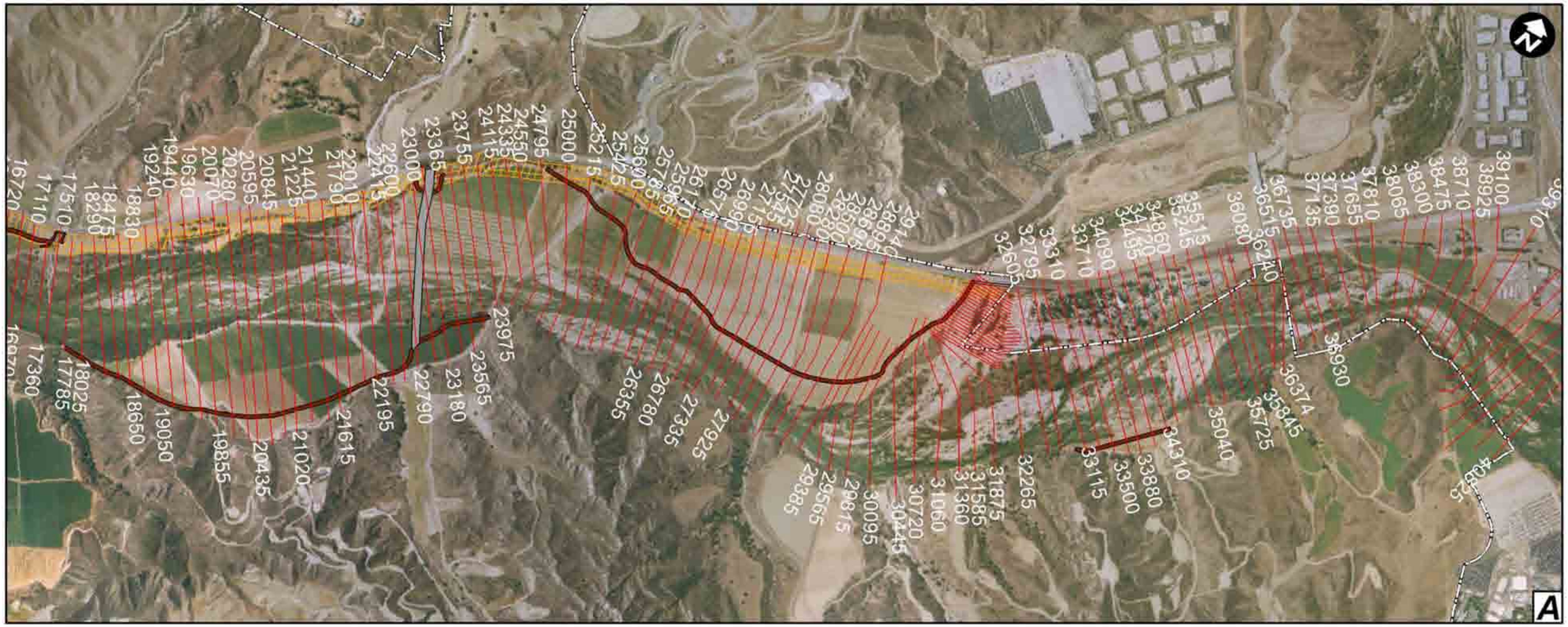
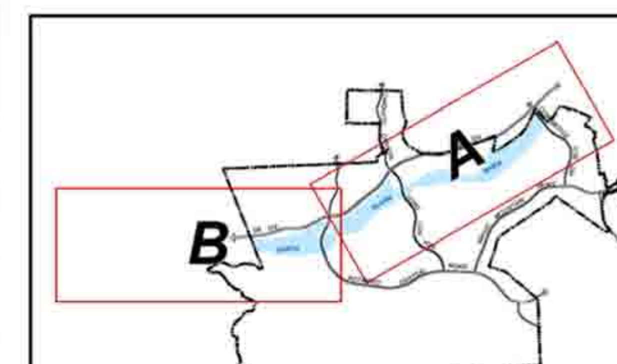
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Bridge Locations
- Utility Corridor
- Cross Sections





Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

PACE
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Figure 5.6a

ALTERNATIVE 7 (Avoidance)
VELOCITIES WORKMAP
SANTA CLARA RIVER

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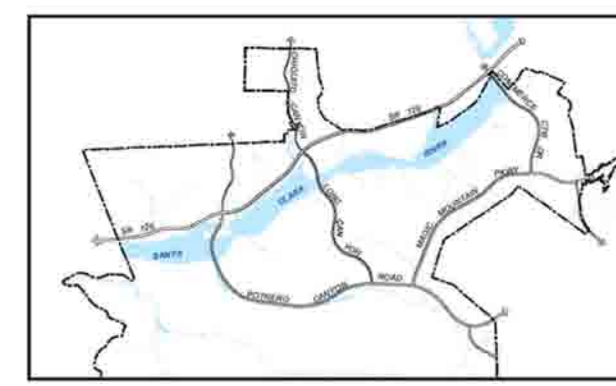
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

Newhall Ranch Specific Plan Boundary
Bank Stabilization
Utility Corridor
Bridge Locations
10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

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Figure 5.6b

ALTERNATIVE 7 (Avoidance)
2 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

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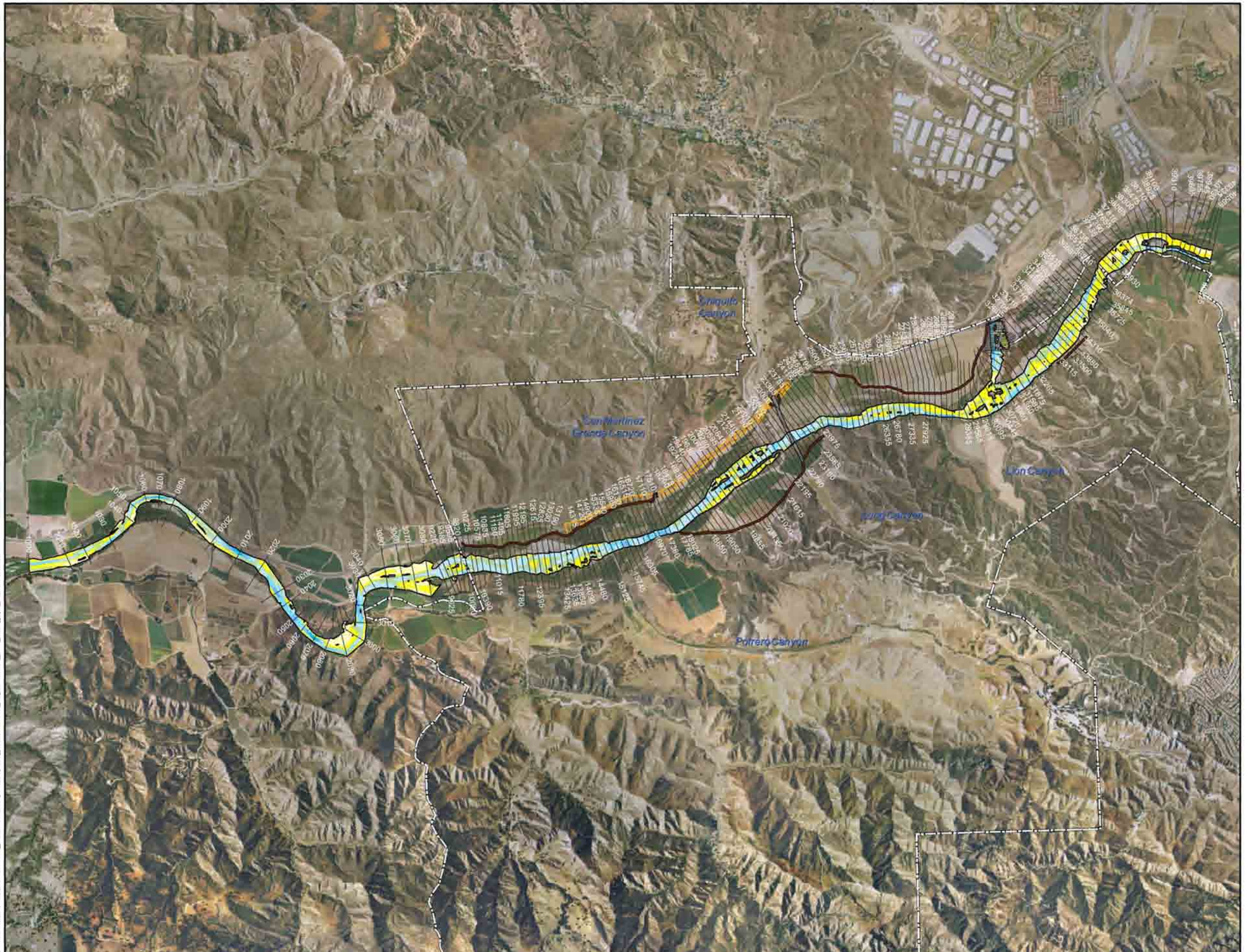


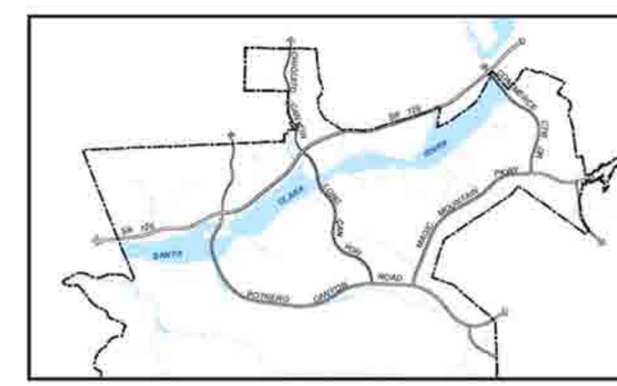
NEWHALL LAND
A LENNAR/LNR COMPANY

LEGEND

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

PACE
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Figure 5.6c

ALTERNATIVE 7 (Avoidance)
5 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

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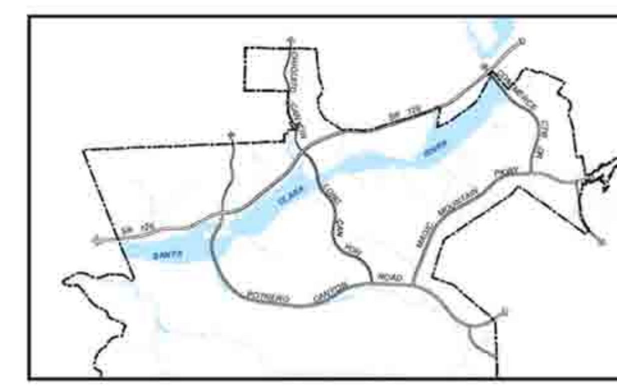
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



1,750 875 0 1,750 Feet
500 250 0 500 Meters

PACE
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Figure 5.6d

ALTERNATIVE 7 (Avoidance)
10 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

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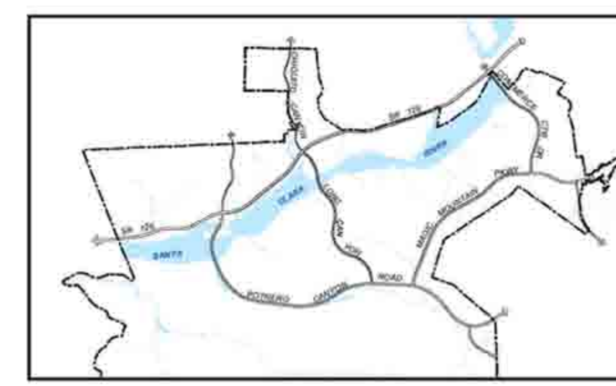
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

PACE
Advanced Water Engineering

Figure 5.6e

ALTERNATIVE 7 (Avoidance)
20 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

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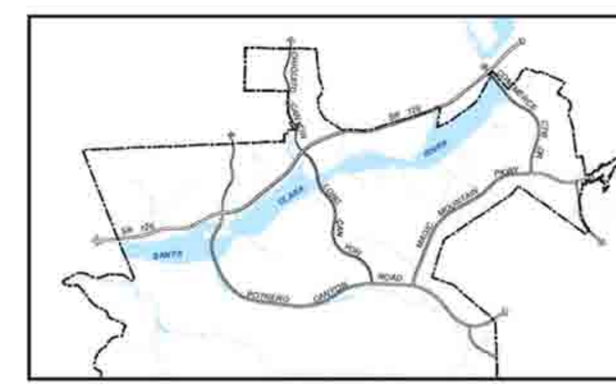
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

PACE
Advanced Water Engineering

Figure 5.6f

ALTERNATIVE 7 (Avoidance)
50 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

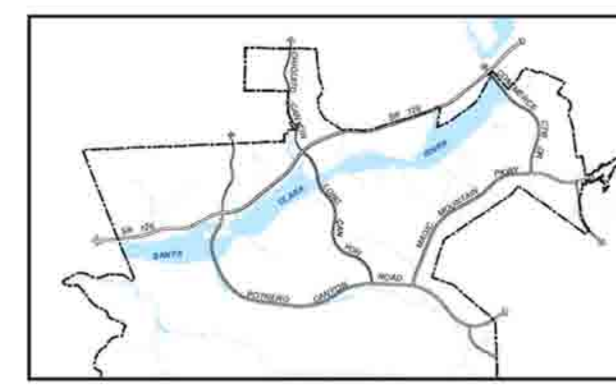
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



1,750 875 0 1,750 Feet

500 250 0 500 Meters

PACE
Advanced Water Engineering

Figure 5.6g

ALTERNATIVE 7 (Avoidance)
100 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

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NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

Newhall Ranch Specific Plan Boundary
Bank Stabilization
Utility Corridor
Bridge Locations
Cross Sections

Velocity Profile (fps)

0 - 2
2 - 4
4 - 6
6 - 8
8 - 10
10 - 12
12 - 15
15 - 18
18 - 21
21 - 24
24 - 27
27 - 30
30 - 39

Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

PACE

Figure 5.6h

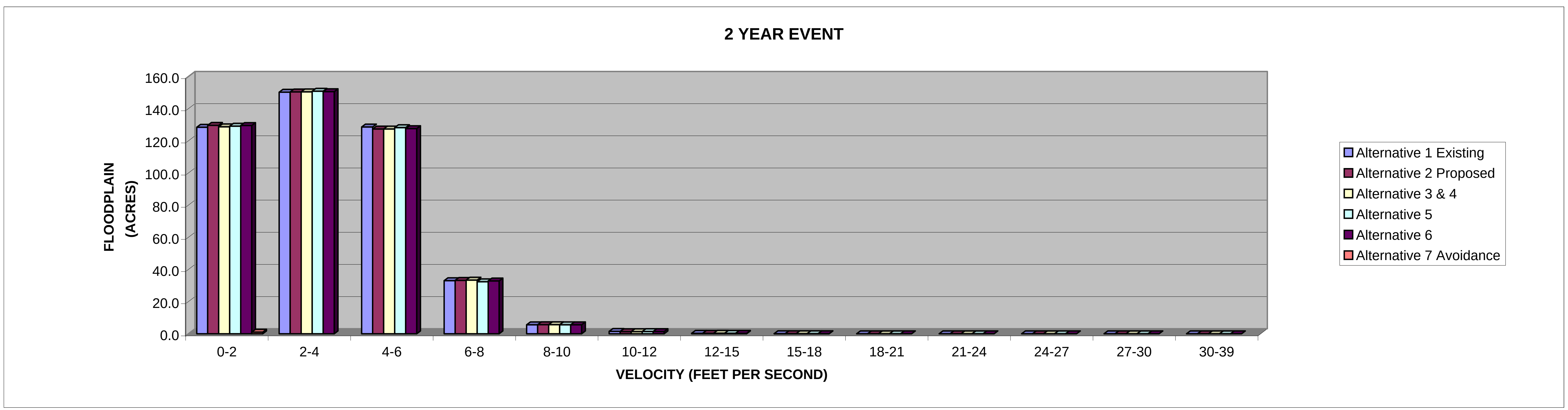
ALTERNATIVE 7 (Avoidance)
CAPITAL FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-6h_scr_Alt7_CAPyr_112108.mxd

FIGURE 5.7a: FLOODPLAIN AREA BY VELOCITY DISTRIBUTION, 2-YEAR

2-YEAR - Floodplain Area by Velocity Distribution

Velocity (fps)	Alternative 1 (Existing) Area (AC)	Alternative 2 (Proposed) Area (AC)	Delta (AC)	Delta % (%)	Alternative 3&4 Area (AC)	Delta (AC)	Delta % (%)	Alternative 5 Area (AC)	Delta (AC)	Delta % (%)	Alternative 6 Area (AC)	Delta (AC)	Delta % (%)	Alternative 7 (Avoidance) Area (AC)	Delta (AC)	Delta % (%)
0-2	128.4	129.6	1.2	0.9%	128.7	0.3	0.2%	129.1	0.7	0.5%	129.5	1.1	0.9%	130.0	1.6	1.2%
2-4	150.2	150.4	0.2	0.1%	150.5	0.2	0.1%	150.9	0.6	0.4%	150.6	0.3	0.2%	149.3	-0.9	-0.6%
4-6	128.6	127.3	-1.2	-0.9%	127.3	-1.2	-0.9%	128.2	-0.4	-0.3%	127.6	-1.0	-0.8%	128.0	-0.6	-0.5%
6-8	33.0	33.2	0.2	0.6%	33.4	0.4	1.2%	32.3	-0.7	-2.1%	32.8	-0.2	-0.6%	33.3	0.3	0.9%
8-10	5.6	5.7	0.1	1.8%	5.6	0.0	0.0%	5.6	0.0	0.0%	5.6	0.0	0.0%	5.5	-0.1	-1.8%
10-12	1.5	1.3	-0.2	-13.6%	1.3	-0.2	-13.6%	1.4	-0.1	-6.8%	1.4	-0.1	-6.8%	1.3	-0.2	-13.6%
12-15	0.3	0.3	0.0	0.0%	0.4	0.1	37.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%
15-18	0.1	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%
18-21	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
21-24	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
24-27	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
27-30	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
30-39	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
	447.6	**447.8**	**0.2**	**0.0%**	**447.1**	**-0.5**	**-0.1%**	**447.7**	**0.1**	**0.0%**	**447.7**	**0.1**	**0.0%**	**447.7**	**0.0**	**0.0%**

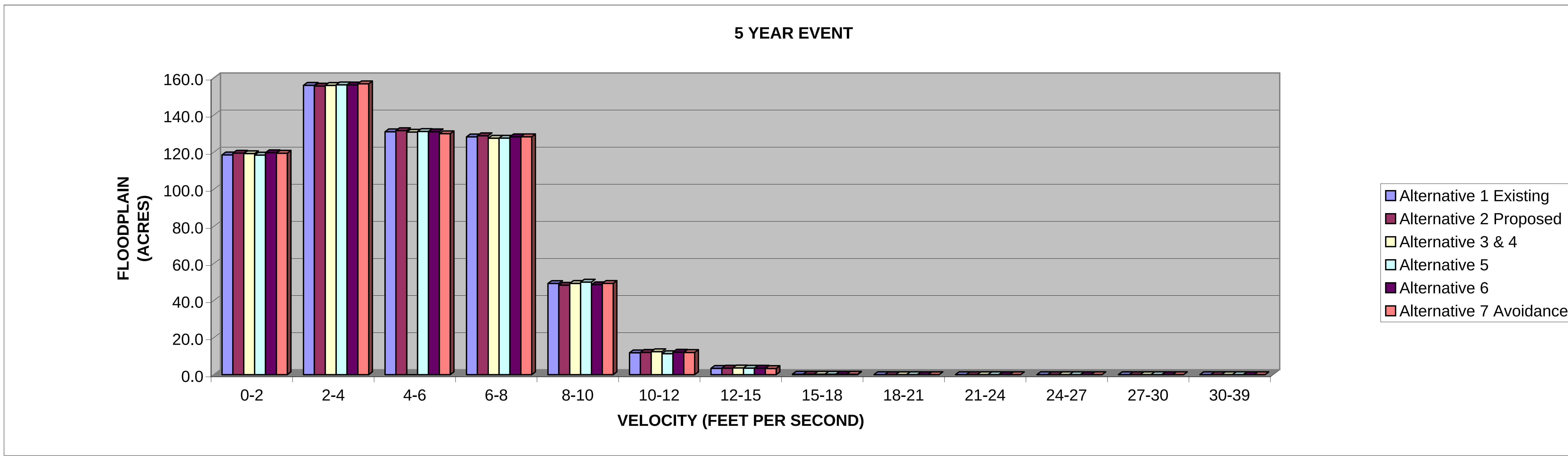


PACE

FIGURE 5.7b: FLOODPLAIN AREA BY VELOCITY DISTRIBUTION, 5-YEAR

5-YEAR - Floodplain Area by Velocity Distribution

Velocity (fps)	Alternative 1 (Existing) Area (AC)	Alternative 2 (Proposed) Area (AC)	Delta (AC)	Delta % (%)	Alternative 3&4 Area (AC)	Delta (AC)	Delta % (%)	Alternative 5 Area (AC)	Delta (AC)	Delta % (%)	Alternative 6 Area (AC)	Delta (AC)	Delta % (%)	Alternative 7 (Avoidance) Area (AC)	Delta (AC)	Delta % (%)
0-2	118.5	119.4	0.9	0.8%	119.2	0.7	0.6%	118.4	-0.1	-0.1%	119.7	1.2	1.0%	119.4	0.9	0.8%
2-4	156.0	155.6	-0.4	-0.3%	156.0	-0.1	-0.1%	156.3	0.2	0.1%	156.2	0.2	0.1%	156.8	0.8	0.5%
4-6	131.0	131.6	0.6	0.5%	130.8	-0.2	-0.2%	131.1	0.2	0.2%	131.0	0.0	0.0%	129.9	-1.1	-0.8%
6-8	128.2	128.8	0.6	0.5%	127.5	-0.7	-0.5%	127.5	-0.7	-0.5%	128.3	0.0	0.0%	128.3	0.1	0.1%
8-10	49.2	48.3	-0.9	-1.8%	49.2	0.0	0.0%	49.9	0.8	1.6%	48.5	-0.7	-1.4%	49.2	0.0	0.0%
10-12	11.8	12.0	0.2	1.7%	12.4	0.6	5.1%	11.3	-0.5	-4.2%	12.2	0.4	3.4%	12.0	0.2	1.7%
12-15	3.4	3.5	0.1	2.9%	3.6	0.2	5.9%	3.5	0.1	2.9%	3.5	0.1	2.9%	3.3	-0.1	-2.9%
15-18	0.3	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%
18-21	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
21-24	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
24-27	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
27-30	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
30-39	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
	598.4	**599.5**	**1.2**	**0.2%**	**598.9**	**0.6**	**0.1%**	**598.4**	**0.0**	**0.0%**	**599.6**	**1.3**	**0.2%**	**599.2**	**0.9**	**0.2%**



PACE

FIGURE 5.7c: FLOODPLAIN AREA BY VELOCITY DISTRIBUTION, 10-YEAR

10 YEAR - Floodplain Area by Velocity Distribution

Velocity (fps)	Alternative 1 (Existing) Area (AC)	Alternative 2 (Proposed) Area (AC)	Delta (AC)	Delta % (%)	Alternative 3&4 Area (AC)	Delta (AC)	Delta % (%)	Alternative 5 Area (AC)	Delta (AC)	Delta % (%)	Alternative 6 Area (AC)	Delta (AC)	Delta % (%)	Alternative 7 (Avoidance) Area (AC)	Delta (AC)	Delta % (%)
0-2	133.0	129.3	-3.8	-2.9%	127.9	-5.1	-3.8%	129.4	-3.6	-2.7%	129.8	-3.3	-2.5%	131.7	-1.4	-1.1%
2-4	173.3	174.2	0.9	0.5%	173.1	-0.2	-0.1%	172.6	-0.7	-0.4%	173.3	0.0	0.0%	173.3	0.0	0.0%
4-6	130.6	132.4	1.8	1.4%	129.2	-1.4	-1.1%	128.2	-2.4	-1.8%	128.7	-1.9	-1.5%	130.2	-0.4	-0.3%
6-8	136.0	132.5	-3.4	-2.5%	134.9	-1.1	-0.8%	134.5	-1.5	-1.1%	135.7	-0.3	-0.2%	135.3	-0.6	-0.4%
8-10	99.8	101.0	1.2	1.2%	101.7	1.9	1.9%	101.7	1.9	1.9%	100.7	0.9	0.9%	100.5	0.7	0.7%
10-12	35.0	36.0	1.0	2.9%	35.7	0.7	2.0%	36.4	1.4	4.0%	35.0	0.0	0.0%	35.1	0.1	0.3%
12-15	9.9	9.2	-0.7	-7.1%	10.1	0.2	2.0%	9.2	-0.7	-7.1%	9.7	-0.2	-2.0%	9.8	-0.1	-1.0%
15-18	2.3	2.3	0.0	0.0%	2.2	0.0	0.0%	2.2	0.0	0.0%	2.2	0.0	0.0%	2.2	0.0	0.0%
18-21	0.2	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.2	0.0	0.0%
21-24	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
24-27	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
27-30	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
30-39	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
	720.1	**717.1**	**-3.0**	**-0.4%**	**715.2**	**-4.9**	**-0.7%**	**714.4**	**714.4**	**99.2%**	**715.3**	**714.3**	**99.2%**	**718.3**	**717.3**	**99.6%**

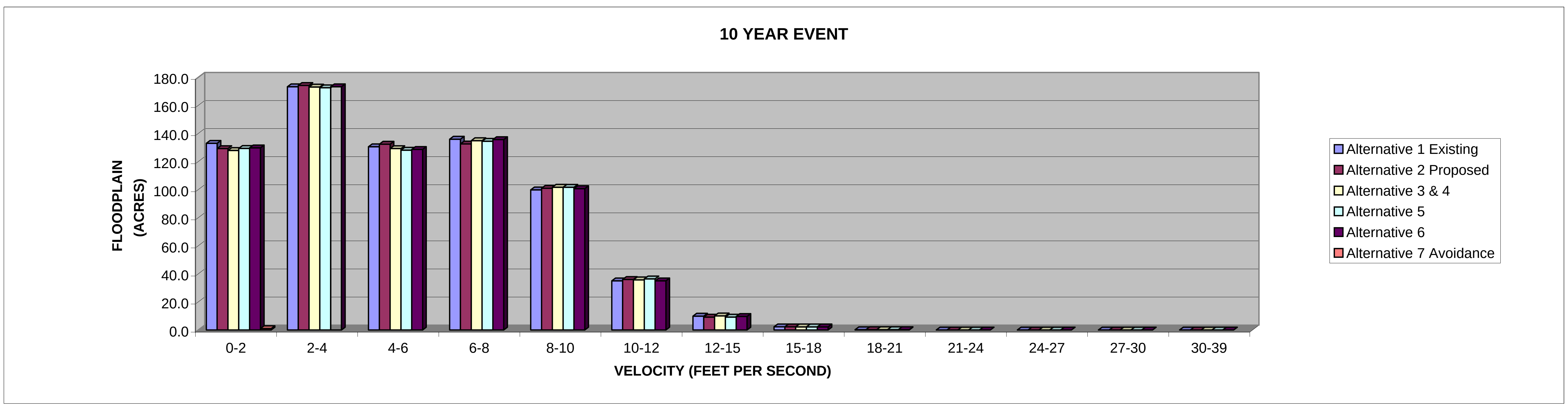


FIGURE 5.7d: FLOODPLAIN AREA BY VELOCITY DISTRIBUTION, 20-YEAR

20 YEAR - Floodplain Area by Velocity Distribution

Velocity (fps)	Alternative 1 (Existing) Area (AC)	Alternative 2 (Proposed) Area (AC)	Delta (AC)	Delta % (%)	Alternative 3&4 Area (AC)	Delta (AC)	Delta % (%)	Alternative 5 Area (AC)	Delta (AC)	Delta % (%)	Alternative 6 Area (AC)	Delta (AC)	Delta % (%)	Alternative 7 (Avoidance) Area (AC)	Delta (AC)	Delta % (%)
0-2	209.0	185.3	-23.7	-11.3%	185.4	-23.6	-11.3%	181.3	-27.7	-13.3%	183.0	-26.1	-12.5%	205.5	-3.5	-1.7%
2-4	273.3	230.1	-43.2	-15.8%	233.8	-39.5	-14.5%	229.8	-43.4	-15.9%	234.9	-38.4	-14.1%	265.8	-7.4	-2.7%
4-6	161.7	156.6	-5.1	-3.2%	156.9	-4.8	-3.0%	149.5	-12.3	-7.6%	151.1	-10.6	-6.6%	162.1	0.3	0.2%
6-8	135.0	135.5	0.5	0.4%	134.0	-1.0	-0.7%	131.8	-3.2	-2.4%	133.1	-1.9	-1.4%	135.6	0.6	0.4%
8-10	128.5	126.6	-1.9	-1.5%	124.9	-3.5	-2.7%	124.9	-3.6	-2.8%	126.4	-2.0	-1.6%	127.9	-0.6	-0.5%
10-12	64.6	65.8	1.2	1.9%	68.6	4.0	6.2%	65.5	0.9	1.4%	64.7	0.1	0.2%	64.5	-0.2	-0.3%
12-15	23.1	25.0	1.9	8.2%	26.4	3.3	14.3%	25.2	2.1	9.1%	24.6	1.5	6.5%	23.4	0.3	1.3%
15-18	2.4	2.5	0.1	4.1%	2.6	0.2	8.3%	2.5	0.1	4.1%	2.7	0.3	12.4%	2.4	0.0	0.0%
18-21	1.0	0.8	-0.2	-19.8%	0.8	-0.2	-19.8%	0.8	-0.2	-19.8%	0.8	-0.2	-19.8%	1.0	0.0	0.0%
21-24	0.3	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%
24-27	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
27-30	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
30-39	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
	999.0	**928.6**	**-70.4**	**-7.0%**	**933.8**	**-65.1**	**-6.5%**	**911.7**	**-87.3**	**-8.7%**	**921.6**	**-77.4**	**-7.7%**	**988.4**	**-10.5**	**-1.1%**

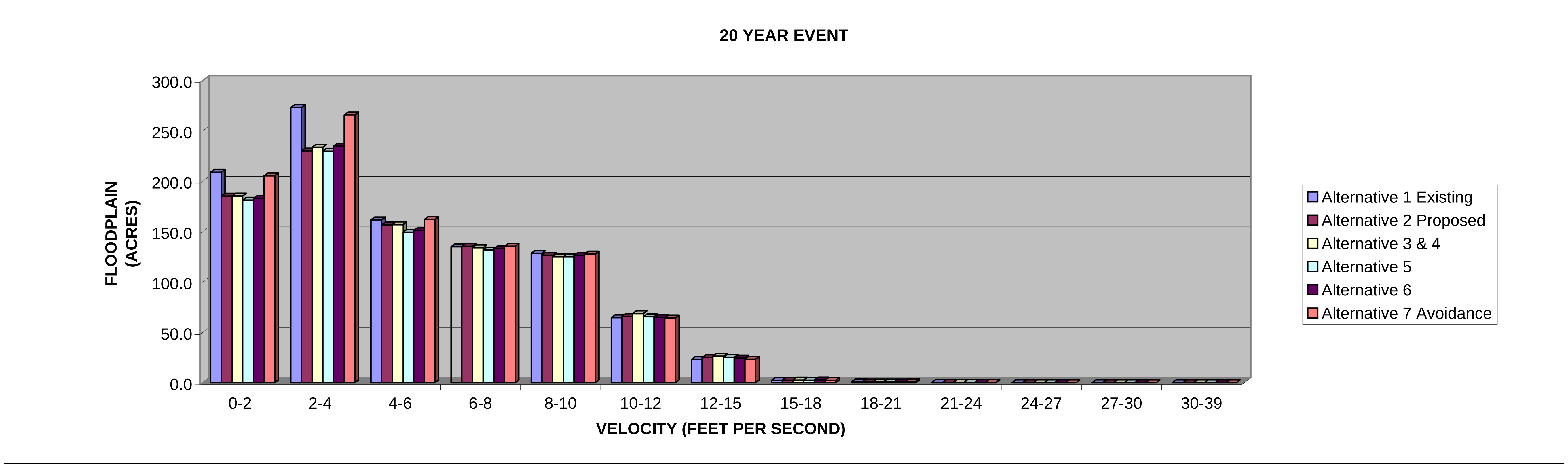


FIGURE 5.7e: FLOODPLAIN AREA BY VELOCITY DISTRIBUTION, 50-YEAR

50 YEAR - Floodplain Area by Velocity Distribution

Velocity (fps)	Alternative 1 (Existing) Area (AC)	Alternative 2 (Proposed) Area (AC)	Delta (AC)	Delta % (%)	Alternative 3&4 Area (AC)	Delta (AC)	Delta % (%)	Alternative 5 Area (AC)	Delta (AC)	Delta % (%)	Alternative 6 Area (AC)	Delta (AC)	Delta % (%)	Alternative 7 (Avoidance) Area (AC)	Delta (AC)	Delta % (%)
0-2	230.8	220.7	-10.1	-4.4%	231.4	0.6	0.3%	228.3	-2.5	-1.1%	224.4	-6.3	-2.7%	228.6	-2.2	-1.0%
2-4	340.0	293.7	-46.3	-13.6%	294.3	-45.8	-13.5%	293.8	-46.2	-13.6%	297.0	-43.0	-12.6%	345.2	5.1	1.5%
4-6	253.6	188.4	-65.2	-25.7%	188.1	-65.5	-25.8%	191.0	-62.6	-24.7%	190.9	-62.7	-24.7%	248.2	-5.4	-2.1%
6-8	155.9	159.0	3.1	2.0%	161.2	5.4	3.5%	160.0	4.1	2.6%	159.6	3.7	2.4%	155.2	-0.7	-0.4%
8-10	136.5	143.7	7.2	5.3%	146.9	10.4	7.6%	146.1	9.6	7.0%	146.0	9.5	7.0%	137.2	0.7	0.5%
10-12	105.6	95.9	-9.7	-9.2%	94.5	-11.1	-10.5%	95.6	-10.0	-9.5%	96.5	-9.1	-8.6%	104.8	-0.8	-0.8%
12-15	58.6	49.7	-8.9	-15.2%	52.2	-6.4	-10.9%	47.2	-11.4	-19.5%	47.1	-11.5	-19.6%	57.6	-1.1	-1.9%
15-18	10.6	8.7	-1.9	-18.0%	9.2	-1.4	-13.3%	7.5	-3.1	-29.4%	8.8	-1.8	-17.0%	10.7	0.2	1.9%
18-21	1.7	1.2	-0.4	-23.8%	1.2	-0.5	-29.8%	1.2	-0.5	-29.8%	1.2	-0.5	-29.8%	1.7	0.0	0.0%
21-24	0.7	0.5	-0.2	-28.2%	0.5	-0.2	-28.2%	0.5	-0.2	-28.2%	0.5	-0.2	-28.2%	0.7	0.0	0.0%
24-27	0.2	0.2	-0.1	-41.7%	0.2	-0.1	-41.7%	0.2	0.0	0.0%	0.2	-0.1	-41.7%	0.2	0.0	0.0%
27-30	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
30-39	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
	1294.2	**1161.7**	**-132.5**	**-10.2%**	**1179.7**	**-114.5**	**-8.8%**	**1171.4**	**1171.5**	**90.5%**	**1172.2**	**1171.3**	**90.5%**	**1290.0**	**1289.1**	**99.6%**

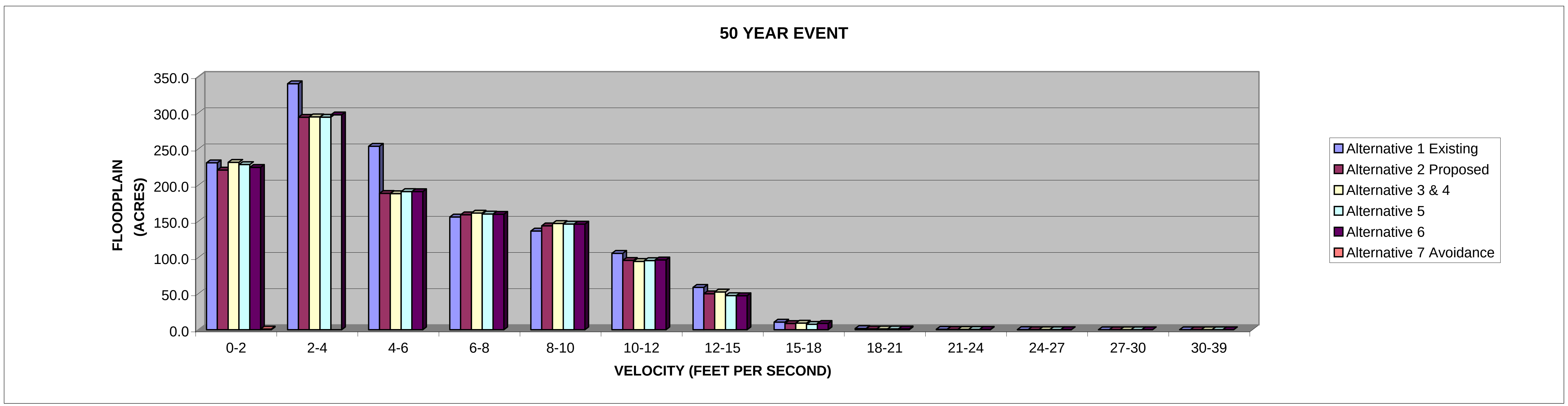


FIGURE 5.7f: FLOODPLAIN AREA BY VELOCITY DISTRIBUTION, 100-YEAR

100 YEAR - Floodplain Area by Velocity Distribution

Velocity (fps)	Alternative 1 (Existing) Area (AC)	Alternative 2 (Proposed) Area (AC)	Delta (AC)	Delta % (%)	Alternative 3&4 Area (AC)	Delta (AC)	Delta % (%)	Alternative 5 Area (AC)	Delta (AC)	Delta % (%)	Alternative 6 Area (AC)	Delta (AC)	Delta % (%)	Alternative 7 (Avoidance) Area (AC)	Delta (AC)	Delta % (%)
0-2	171.2	192.7	21.5	12.6%	199.6	28.4	16.6%	166.1	-5.1	-3.0%	176.1	4.9	2.9%	169.7	-1.6	-0.9%
2-4	340.0	323.2	-16.8	-4.9%	326.0	-13.9	-4.1%	309.3	-30.7	-9.0%	311.2	-28.8	-8.5%	341.0	1.0	0.3%
4-6	281.7	219.1	-62.6	-22.2%	215.8	-66.0	-23.4%	216.2	-65.6	-23.3%	217.1	-64.6	-22.9%	280.2	-1.5	-0.5%
6-8	222.6	171.9	-50.7	-22.8%	174.0	-48.7	-21.9%	162.8	-59.8	-26.9%	168.9	-53.7	-24.1%	218.9	-3.7	-1.7%
8-10	135.8	164.9	29.2	21.5%	167.7	31.9	23.5%	160.7	24.9	18.3%	162.3	26.6	19.6%	134.1	-1.6	-1.2%
10-12	128.0	111.2	-16.9	-13.2%	114.0	-14.1	-11.0%	125.6	-2.4	-1.9%	120.4	-7.6	-5.9%	131.2	3.2	2.5%
12-15	93.9	73.2	-20.6	-21.9%	72.0	-21.9	-23.3%	79.1	-14.8	-15.8%	79.0	-14.9	-15.9%	94.3	0.5	0.5%
15-18	26.5	21.5	-5.0	-18.9%	22.9	-3.6	-13.6%	24.1	-2.3	-8.7%	23.2	-3.3	-12.5%	24.9	-1.6	-6.0%
18-21	6.4	4.7	-1.7	-26.4%	4.8	-1.7	-26.4%	5.5	-0.9	-14.0%	5.5	-1.0	-15.6%	6.3	-0.2	-3.1%
21-24	1.3	1.2	0.0	0.0%	1.2	-0.1	-7.9%	1.1	-0.2	-15.7%	1.1	-0.2	-15.7%	1.3	0.0	0.0%
24-27	0.3	0.2	-0.1	-37.0%	0.2	-0.1	-37.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%
27-30	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.1	0.1	0.0%	0.1	0.1	0.0%	0.0	0.0	0.0%
30-39	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
	1407.6	**1283.8**	**-123.8**	**-8.8%**	**1298.0**	**-109.6**	**-7.8%**	**1250.9**	**-156.8**	**-11.1%**	**1265.3**	**-142.4**	**-10.1%**	**1402.2**	**-5.5**	**-0.4%**

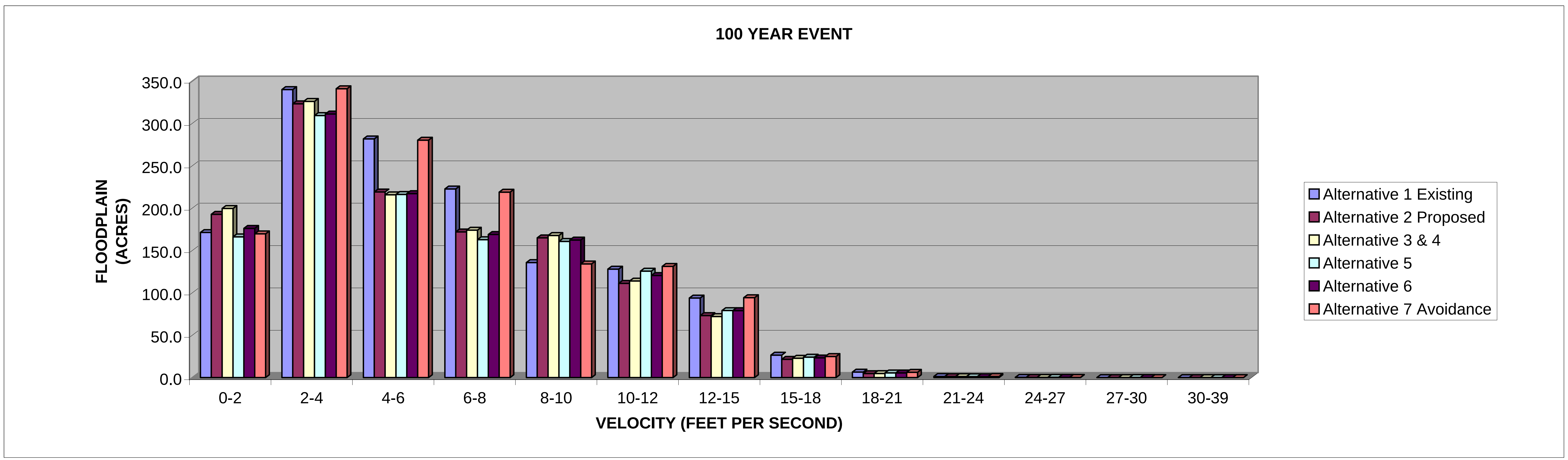


FIGURE 5.7g: FLOODPLAIN AREA BY VELOCITY DISTRIBUTION, QCAP

QCAP - Floodplain Area by Velocity Distribution

Velocity (fps)	Alternative 1 (Existing) Area (AC)	Alternative 2 (Proposed) Area (AC)	Delta (AC)	Delta % (%)	Alternative 3&4 Area (AC)	Delta (AC)	Delta % (%)	Alternative 5 Area (AC)	Delta (AC)	Delta % (%)	Alternative 6 Area (AC)	Delta (AC)	Delta % (%)	Alternative 7 (Avoidance) Area (AC)	Delta (AC)	Delta % (%)
0-2	116.7	104.4	-12.3	-10.5%	109.2	-7.5	-6.4%	105.3	-11.5	-9.9%	105.2	-11.6	-9.9%	112.4	-4.3	-3.7%
2-4	287.0	253.5	-33.5	-11.7%	266.3	-20.8	-7.2%	253.9	-33.1	-11.5%	246.9	-40.2	-14.0%	277.8	-9.3	-3.2%
4-6	305.1	270.6	-34.5	-11.3%	274.4	-30.6	-10.0%	273.4	-31.7	-10.4%	276.5	-28.6	-9.4%	294.2	-10.8	-3.5%
6-8	247.6	203.3	-44.3	-17.9%	201.2	-46.4	-18.7%	199.2	-48.4	-19.6%	200.4	-47.2	-19.1%	243.2	-4.3	-1.7%
8-10	211.6	137.4	-74.2	-35.1%	141.9	-69.7	-32.9%	140.4	-71.1	-33.6%	138.9	-72.6	-34.3%	203.0	-8.5	-4.0%
10-12	199.2	131.8	-67.4	-33.8%	141.6	-57.6	-28.9%	129.2	-70.0	-35.1%	129.0	-70.2	-35.2%	208.0	8.8	4.4%
12-15	173.2	193.4	20.3	11.7%	194.2	21.1	12.2%	194.2	21.0	12.1%	197.5	24.3	14.0%	170.7	-2.5	-1.4%
15-18	78.5	89.1	10.5	13.4%	87.1	8.5	10.8%	91.4	12.9	16.4%	93.4	14.9	19.0%	78.4	-0.1	-0.1%
18-21	34.5	42.8	8.3	24.1%	39.8	5.3	15.4%	41.5	7.1	20.6%	42.1	7.6	22.0%	33.9	-0.6	-1.7%
21-24	14.1	14.6	0.5	3.6%	14.5	0.5	3.6%	15.4	1.4	10.0%	15.5	1.5	10.7%	14.4	0.3	2.1%
24-27	4.3	4.0	-0.3	-7.0%	4.2	-0.1	-2.3%	4.2	-0.1	-2.3%	4.2	-0.1	-2.3%	4.6	0.4	9.3%
27-30	2.2	2.1	-0.1	-4.5%	2.2	0.0	0.0%	2.2	0.0	0.0%	2.2	0.0	0.0%	2.2	0.0	0.0%
30-39	1.1	0.8	-0.4	-36.0%	0.7	-0.4	-36.0%	0.8	-0.3	-27.0%	0.8	-0.3	-27.0%	1.1	0.0	0.0%
	1675.0	**1447.7**	**-227.3**	**-13.6%**	**1477.4**	**-197.6**	**-11.8%**	**1451.1**	**-223.9**	**-13.4%**	**1452.4**	**-222.6**	**-13.3%**	**1643.9**	**-31.1**	**-1.9%**

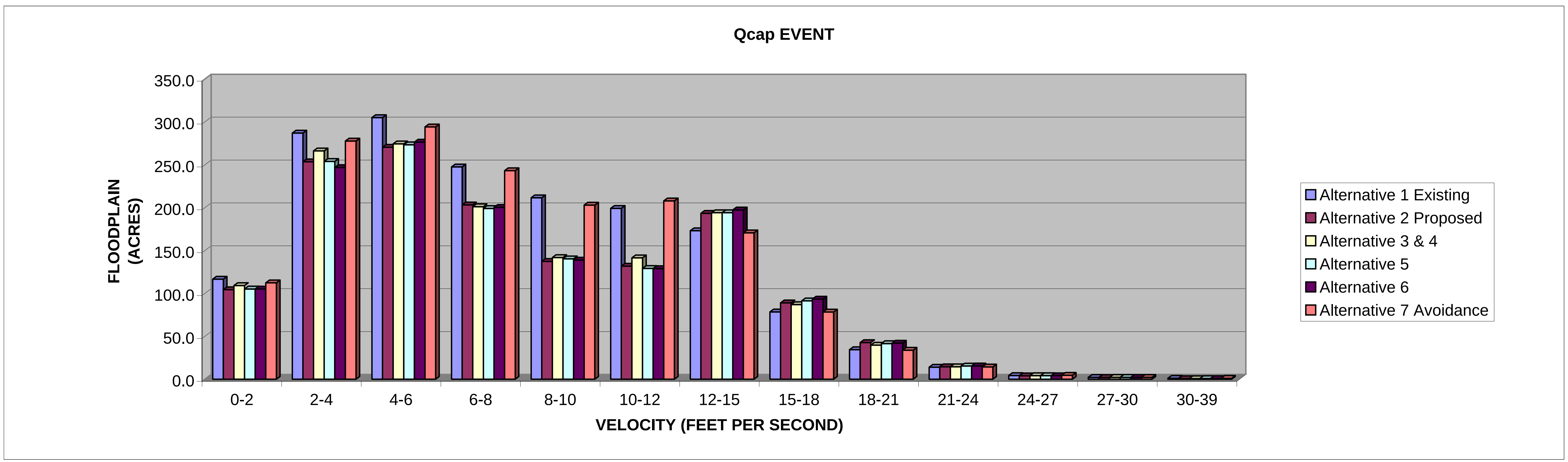


FIGURE 6.1a: CHANGE IN FLOODPLAIN AREA WHERE VELOCITY > 4fps BY VEGETATION, 2-YEAR

2 YEAR

Vegetation Type	Alternative 1 (Existing)	Alternative 2 (Proposed)	DELTA	DELTA %	Alternative 3&4	DELTA	DELTA %	Alternative 5	DELTA	DELTA %	Alternative 6	DELTA	DELTA %	Alternative 7 (Avoidance)	DELTA	DELTA %
AGR	0.5	0.5	0.0	0.0%	0.5	0.0	0.0%	0.4	-0.1	-20.0%	0.5	0.0	0.0%	0.3	-0.2	-40.0%
AS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
AWS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
BSS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CGL	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CHP	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CLOW	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CSB	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CSB-CB	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CSB-CHP	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CSB-PS	0.2	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	-0.1	-50.0%
dCSB	0.1	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%
DEV	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
DL	1.2	1.2	0.0	0.0%	1.2	0.0	0.0%	1.1	-0.1	-8.3%	1.1	-0.1	-8.3%	1.1	-0.1	-8.3%
dRS	0.6	0.6	0.0	0.0%	0.6	0.0	0.0%	0.6	0.0	0.0%	0.6	0.0	0.0%	0.6	0.0	0.0%
dSCWRF	0.0	0.1	0.1	0.0%	0.1	0.1	0.0%	0.1	0.1	0.0%	0.0	0.0	0.0%	0.1	0.1	0.0%
dSWS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
GRG	0.5	0.5	0.0	0.0%	0.5	0.0	0.0%	0.5	-0.1	-20.0%	0.5	0.0	0.0%	0.5	0.0	0.0%
HW	97.0	96.3	-0.7	-0.7%	96.6	-0.4	-0.4%	96.0	-1.0	-1.0%	96.1	-0.9	-0.9%	96.9	-0.1	-0.1%
MFS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
OC	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
ORN	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
RW	55.6	55.5	-0.1	-0.2%	55.6	0.0	0.0%	56.0	0.4	0.7%	55.7	0.1	0.2%	55.5	-0.1	-0.2%
SCLORF	0.2	0.1	-0.1	-50.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%
SCWRF	12.4	12.1	-0.3	-2.4%	11.9	-0.5	-4.0%	12.0	-0.4	-3.2%	12.0	-0.4	-3.2%	12.2	-0.2	-1.6%
SWS	0.1	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%
TAM	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
VOW	0.6	0.6	0.0	0.0%	0.6	0.0	0.0%	0.6	0.0	0.0%	0.6	0.0	0.0%	0.6	0.0	0.0%
Not Coded	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
< 4fps	278.6	280.0	-1.1	-53.3%	279.1	-1.0	-4.4%	280.0	-1.3	-51.9%	280.0	-1.3	-12.3%	279.3	-0.6	-100.2%
TOTAL	447.6	447.9	-1.1	-0.2%	447.2	-1.0	-0.2%	447.7	-1.3	-0.3%	447.7	-1.3	-0.3%	447.7	-0.6	-0.1%

AGR	Agriculture
AS	Alluvial Scrub
AWS	Arrow weed scrub
BSS	Big Sagebrush Scrub
CGL	California Annual Grassland
CHP	Undifferentiated Chaparral
CLOW	Coast Live Oak Woodland
CSB	California Sagebrush Scrub
CSB-CB	California Sagebrush Scrub - California Buckwheat
CSB-CHP	California Sagebrush Scrub/Undifferentiated Chapparal
CSB-PS	California Sagebrush Scrub - Purple Sage
dCSB	Disturbed California Sagebruch Scrub
DEV	Developed
DL	Disturbed Land
dRS	Disturbed Riparian Scrub
dSCWRF	Disturbed Southern Cottonwood-Willow Riparian Forest
dSWS	Disturbed Southern Willow Scrub
GRG	Giant Reed Grassland
HW	Herbaceous Wetlands
MFS	Mulefat Scrub
OC	Open Channel
ORN	Ornamental
RW	River Wash
SCLORF	Southern Coast Live Oak Riparian Forest
SCWRF	Southern Cottonwood/Willow Riparian Forest
SWS	Southern Willow Scrub
TAM	Shrub tamarisk
VOW	Valley Oak Woodland

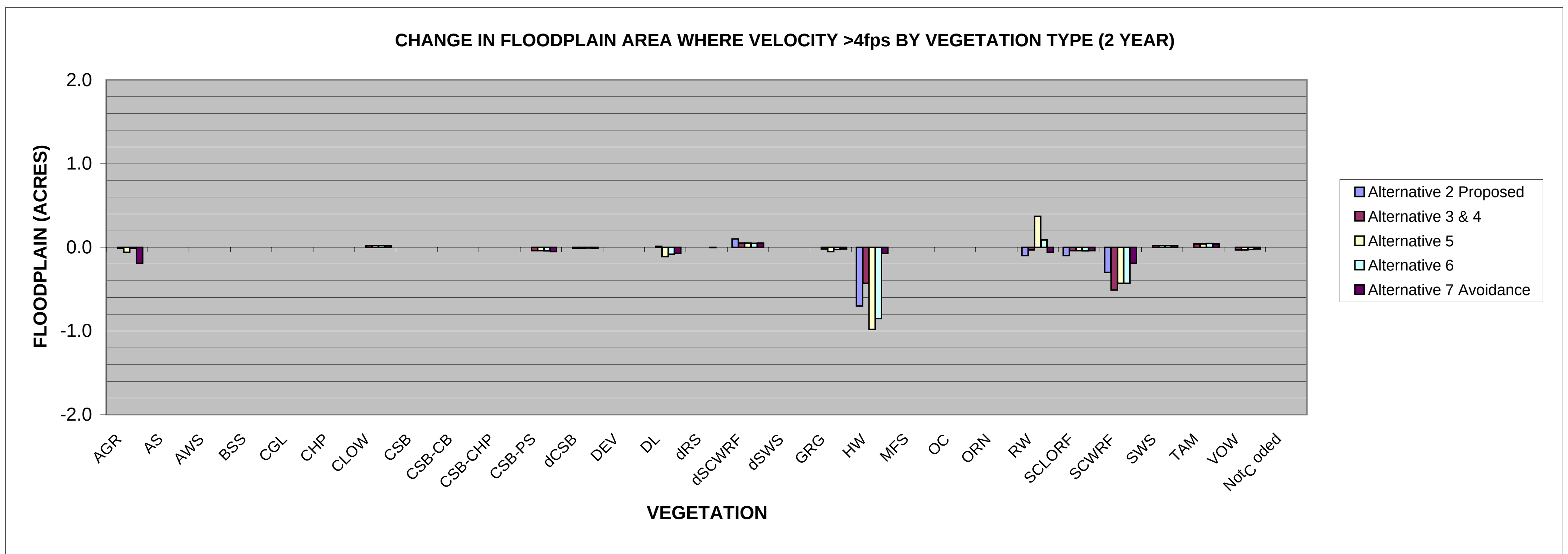
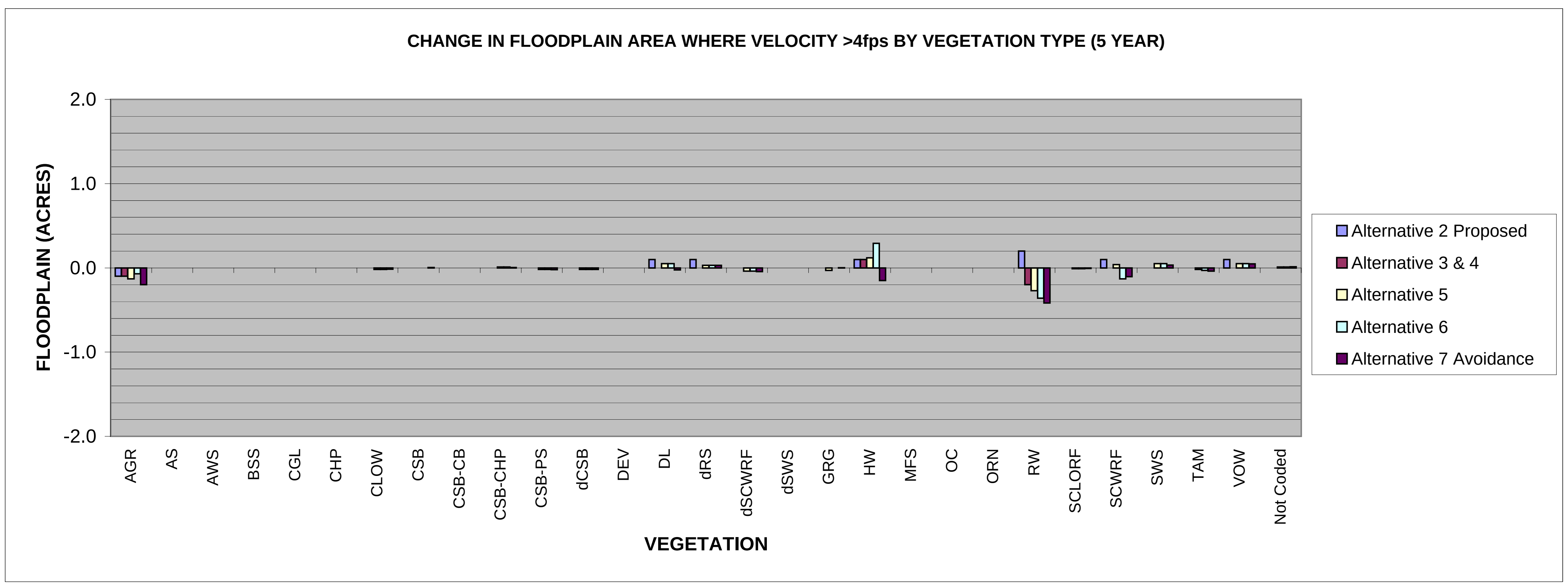


FIGURE 6.1b: CHANGE IN FLOODPLAIN AREA WHERE VELOCITY > 4fps BY VEGETATION, 5-YEAR

5 YEAR

Vegetation Type	Alternative 1 (Existing)	Alternative 2 (Proposed)	DELTA	DELTA %	Alternative 3&4	DELTA	DELTA %	Alternative 5	DELTA	DELTA %	Alternative 6	DELTA	DELTA %	Alternative 7 (Avoidance)	DELTA	DELTA %
AGR	0.8	0.7	-0.1	-12.5%	0.7	-0.1	-12.5%	0.7	-0.1	-12.5%	0.7	-0.1	0.0%	0.6	-0.2	-25.0%
AS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
AWS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
BSS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CGL	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CHP	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CLOW	0.1	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%
CSB	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CSB-CB	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CSB-CHP	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CSB-PS	0.3	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%
dCSB	0.7	0.7	0.0	0.0%	0.7	0.0	0.0%	0.7	0.0	0.0%	0.7	0.0	0.0%	0.7	0.0	0.0%
DEV	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
DL	2.3	2.4	0.1	4.3%	2.3	0.0	0.0%	2.4	0.1	4.3%	2.4	0.1	0.0%	2.3	0.0	0.0%
dRS	1.2	1.3	0.1	8.3%	1.2	0.0	0.0%	1.2	0.0	0.0%	1.2	0.0	0.0%	1.2	0.0	0.0%
dSCWRF	0.2	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%
dSWS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
GRG	1.8	1.8	0.0	0.0%	1.8	0.0	0.0%	1.8	0.0	0.0%	1.8	0.0	0.0%	1.8	0.0	0.0%
HW	181.8	181.9	0.1	0.1%	181.9	0.1	0.1%	181.9	0.1	0.1%	182.1	0.3	0.0%	181.6	-0.2	-0.1%
MFS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
OC	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
ORN	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
RW	100.8	101.0	0.2	0.2%	100.6	-0.2	-0.2%	100.5	-0.3	-0.3%	100.4	-0.4	0.0%	100.4	-0.4	-0.4%
SCLORF	0.2	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%
SCWRF	31.2	31.3	0.1	0.3%	31.2	0.0	0.0%	31.2	0.0	0.0%	31.1	-0.1	0.0%	31.1	-0.1	-0.3%
SWS	0.9	0.9	0.0	0.0%	0.9	0.0	0.0%	1.0	0.0	0.0%	1.0	0.0	0.0%	0.9	0.0	0.0%
TAM	0.5	0.5	0.0	0.0%	0.5	0.0	0.0%	0.5	0.0	0.0%	0.5	0.0	0.0%	0.5	0.0	0.0%
VOW	1.1	1.2	0.1	9.1%	1.1	0.0	0.0%	1.2	0.0	0.0%	1.2	0.0	0.0%	1.1	0.0	0.0%
Not Coded	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
<4 FPS	274.5	275.0	0.5	0.2%	275.1	0.6	0.2%	274.6	0.1	0.0%	275.9	1.4	0.0%	275.9	1.4	0.5%
TOTAL	598.4	599.5	1.1	0.2%	598.8	0.4	0.1%	598.3	-0.1	0.0%	599.6	1.2	0.2%	598.9	0.5	0.1%

AGR	Agriculture
AS	Alluvial Scrub
AWS	Arrow weed scrub
BSS	Big Sagebrush Scrub
CGL	California Annual Grassland
CHP	Undifferentiated Chaparral
CLOW	Coast Live Oak Woodland
CSB	California Sagebrush Scrub
CSB-CB	California Sagebrush Scrub - California Buckwheat
CSB-CHP	California Sagebrush Scrub/Undifferentiated Chapparal
CSB-PS	California Sagebrush Scrub - Purple Sage
dCSB	Disturbed California Sagebruch Scrub
DEV	Developed
DL	Disturbed Land
dRS	Disturbed Riparian Scrub
dSCWRF	Disturbed Southern Cottonwood-Willow Riparian Forest
dSWS	Disturbed Southern Willow Scrub
GRG	Giant Reed Grassland
HW	Herbaceous Wetlands
MFS	Mulefat Scrub
OC	Open Channel
ORN	Ornamental
RW	River Wash
SCLORF	Southern Coast Live Oak Riparian Forest
SCWRF	Southern Cottonwood/Willow Riparian Forest
SWS	Southern Willow Scrub
TAM	Shrub tamarisk
VOW	Valley Oak Woodland



PACE

FIGURE 6.1c: CHANGE IN FLOODPLAIN AREA WHERE VELOCITY > 4fps BY VEGETATION, 10-YEAR

10 YEAR

Vegetation Type	Alternative 1 (Existing)	Alternative 2 (Proposed)	DELTA	DELTA %	Alternative 3&4	DELTA	DELTA %	Alternative 5	DELTA	DELTA %	Alternative 6	DELTA	DELTA %	Alternative 7 (Avoidance)	DELTA	DELTA %
AGR	4.0	4.1	0.1	2.5%	3.4	-0.6	-14.9%	3.4	-0.6	-14.9%	3.4	-0.6	-14.9%	3.3	-0.8	-19.9%
AS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
AWS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
BSS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CGL	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CHP	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CLOW	0.2	0.2	0.1	66.7%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.1	66.7%	0.2	0.0	0.0%
CSB	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CSB-CB	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CSB-CHP	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CSB-PS	0.4	0.4	0.0	0.0%	0.4	0.0	0.0%	0.4	0.0	0.0%	0.4	0.0	0.0%	0.4	0.0	0.0%
dCSB	0.9	0.9	0.0	0.0%	0.9	0.0	0.0%	0.9	0.0	0.0%	0.9	0.0	0.0%	0.9	0.0	0.0%
DEV	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
DL	3.4	3.5	0.1	3.0%	3.4	0.0	0.0%	3.4	0.0	0.0%	3.5	0.1	3.0%	3.4	0.0	0.0%
dRS	1.3	1.3	0.0	0.0%	1.3	0.0	0.0%	1.3	0.0	0.0%	1.3	0.0	0.0%	1.3	0.0	0.0%
dSCWRF	0.2	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%
dSWS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
GRG	2.4	2.4	0.0	0.0%	2.4	0.0	0.0%	2.4	0.0	0.0%	2.4	0.0	0.0%	2.4	0.0	0.0%
HW	228.5	227.8	-0.7	-0.3%	228.6	0.1	0.0%	228.2	-0.4	-0.2%	228.2	-0.3	-0.1%	228.4	-0.1	0.0%
MFS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
OC	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
ORN	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
RW	120.8	121.1	0.3	0.2%	121.4	0.6	0.5%	120.8	0.0	0.0%	120.6	-0.2	-0.2%	121.2	0.3	0.2%
SCLORF	0.2	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%
SCWRF	47.0	47.3	0.3	0.6%	47.5	0.5	1.1%	46.9	-0.1	-0.2%	46.8	-0.2	-0.4%	47.1	0.2	0.4%
SWS	2.0	1.7	-0.3	-14.9%	1.7	-0.3	-14.9%	1.7	-0.3	-14.9%	1.7	-0.3	-14.9%	2.0	0.0	0.0%
TAM	1.0	1.0	0.0	0.0%	1.0	0.0	0.0%	1.0	0.0	0.0%	1.0	0.0	0.0%	1.0	0.0	0.0%
VOW	1.4	1.5	0.1	7.1%	1.4	0.0	0.0%	1.4	0.0	0.0%	1.4	0.0	0.0%	1.4	0.0	0.0%
Not Coded	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
<4 FPS	306.3	303.5	-2.8	-0.9%	301.0	-5.3	-1.7%	302.0	-4.3	-1.4%	303.1	-3.3	-1.1%	305.0	-1.4	-0.5%
TOTAL	720.1	717.1	-3.0	-0.4%	715.2	-4.9	-0.7%	714.4	-1.3	-0.2%	715.3	-1.5	-0.2%	718.3	-1.7	-0.2%

AGR	Agriculture
AS	Alluvial Scrub
AWS	Arrow weed scrub
BSS	Big Sagebrush Scrub
CGL	California Annual Grassland
CHP	Undifferentiated Chaparral
CLOW	Coast Live Oak Woodland
CSB	California Sagebrush Scrub
CSB-CB	California Sagebrush Scrub - California Buckwheat
CSB-CHP	California Sagebrush Scrub/Undifferentiated Chapparal
CSB-PS	California Sagebrush Scrub - Purple Sage
dCSB	Disturbed California Sagebruch Scrub
DEV	Developed
DL	Disturbed Land
dRS	Disturbed Riparian Scrub
dSCWRF	Disturbed Southern Cottonwood-Willow Riparian Forest
dSWS	Disturbed Southern Willow Scrub
GRG	Giant Reed Grassland
HW	Herbaceous Wetlands
MFS	Mulefat Scrub
OC	Open Channel
ORN	Ornamental
RW	River Wash
SCLORF	Southern Coast Live Oak Riparian Forest
SCWRF	Southern Cottonwood/Willow Riparian Forest
SWS	Southern Willow Scrub
TAM	Shrub tamarisk
VOW	Valley Oak Woodland

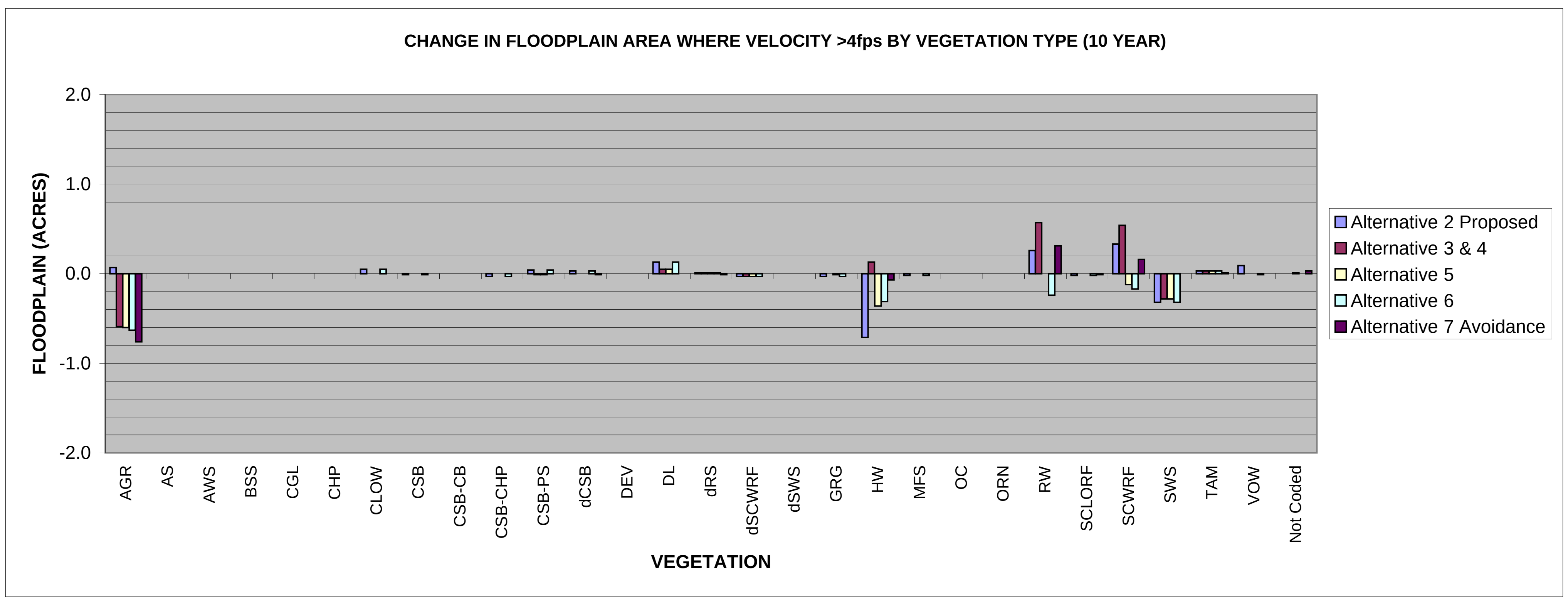


FIGURE 6.1d: CHANGE IN FLOODPLAIN AREA WHERE VELOCITY > 4fps BY VEGETATION, 20-YEAR

20 YEAR

Vegetation Type	Alternative 1 (Existing)	Alternative 2 (Proposed)	DELTA	DELTA %	Alternative 3&4	DELTA	DELTA %	Alternative 5	DELTA	DELTA %	Alternative 6	DELTA	DELTA %	Alternative 7 (Avoidance)	DELTA	DELTA %
AGR	24.1	19.4	-4.7	-19.5%	21.7	-2.4	-10.0%	13.3	-10.7	-44.5%	14.6	-9.5	-39.5%	23.8	-0.3	-1.2%
AS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
AWS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.1	0.1	0.0%	0.0	0.0	0.0%
BSS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CGL	1.0	1.0	0.0	0.0%	1.0	0.0	0.0%	1.0	0.0	0.0%	1.0	0.0	0.0%	1.0	0.0	0.0%
CHP	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CLOW	0.1	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%
CSB	0.1	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%
CSB-CB	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CSB-CHP	0.1	0.0	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%
CSB-PS	0.4	0.4	0.0	0.0%	0.4	0.0	0.0%	0.4	0.0	0.0%	0.4	0.0	0.0%	0.5	0.0	0.0%
dCSB	1.2	1.2	0.0	0.0%	1.2	0.0	0.0%	1.2	0.0	0.0%	1.2	0.0	0.0%	1.2	0.0	0.0%
DEV	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
DL	5.0	4.8	-0.2	-4.0%	4.6	-0.4	-7.9%	4.8	-0.3	-6.0%	4.8	-0.2	-4.0%	5.0	0.0	0.0%
dRS	2.9	2.9	0.0	0.0%	2.9	0.0	0.0%	2.9	0.0	0.0%	2.9	0.0	0.0%	2.9	0.0	0.0%
dSCWRF	0.4	0.4	0.0	0.0%	0.4	0.0	0.0%	0.4	0.0	0.0%	0.4	0.0	0.0%	0.4	0.0	0.0%
dSWS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
GRG	2.5	2.5	0.0	0.0%	2.5	0.0	0.0%	2.5	0.0	0.0%	2.5	0.0	0.0%	2.5	0.0	0.0%
HW	263.1	264.6	1.5	0.6%	264.0	0.9	0.3%	261.8	-1.3	-0.5%	262.2	-0.9	-0.3%	263.2	0.2	0.1%
MFS	1.0	0.6	-0.4	-40.0%	0.6	-0.4	-40.0%	0.6	-0.4	-40.0%	0.5	-0.5	-50.0%	1.0	0.0	0.0%
OC	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
ORN	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
RW	139.9	140.5	0.5	0.4%	140.2	0.3	0.2%	137.9	-2.0	-1.4%	139.4	-0.5	-0.4%	140.3	0.4	0.3%
SCLORF	0.2	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%
SCWRF	69.2	69.1	-0.2	-0.3%	69.4	0.2	0.3%	68.0	-1.2	-1.7%	68.1	-1.1	-1.6%	69.3	0.1	0.1%
SWS	2.9	2.6	-0.2	-7.0%	2.6	-0.3	-10.5%	2.7	-0.2	-7.0%	2.7	-0.2	-7.0%	2.9	0.1	3.5%
TAM	1.1	1.1	0.0	0.0%	1.1	0.0	0.0%	1.1	0.0	0.0%	1.1	0.0	0.0%	1.1	0.0	0.0%
VOW	1.5	1.6	0.1	6.5%	1.5	0.0	0.0%	1.5	0.0	0.0%	1.5	0.0	0.0%	1.5	0.0	0.0%
Not Coded	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
<4 FPS	482.3	415.4	-66.9	-13.9%	419.2	-63.1	-13.1%	411.1	-71.2	-14.8%	417.9	-64.4	-13.4%	471.4	-10.9	-2.3%
TOTAL	998.9	928.5	-3.5	-0.4%	933.8	-2.0	-0.2%	911.7	-16.1	-1.6%	921.6	-12.9	-1.3%	988.4	0.4	0.0%

AGR	Agriculture
AS	Alluvial Scrub
AWS	Arrow weed scrub
BSS	Big Sagebrush Scrub
CGL	California Annual Grassland
CHP	Undifferentiated Chaparral
CLOW	Coast Live Oak Woodland
CSB	California Sagebrush Scrub
CSB-CB	California Sagebrush Scrub - California Buckwheat
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dCSB	Disturbed California Sagebruch Scrub
DEV	Developed
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dSCWRF	Disturbed Southern Cottonwood-Willow Riparian Forest
dSWS	Disturbed Southern Willow Scrub
GRG	Giant Reed Grassland
HW	Herbaceous Wetlands
MFS	Mulefat Scrub
OC	Open Channel
ORN	Ornamental
RW	River Wash
SCLORF	Southern Coast Live Oak Riparian Forest
SCWRF	Southern Cottonwood/Willow Riparian Forest
SWS	Southern Willow Scrub
TAM	Shrub tamarisk
VOW	Valley Oak Woodland

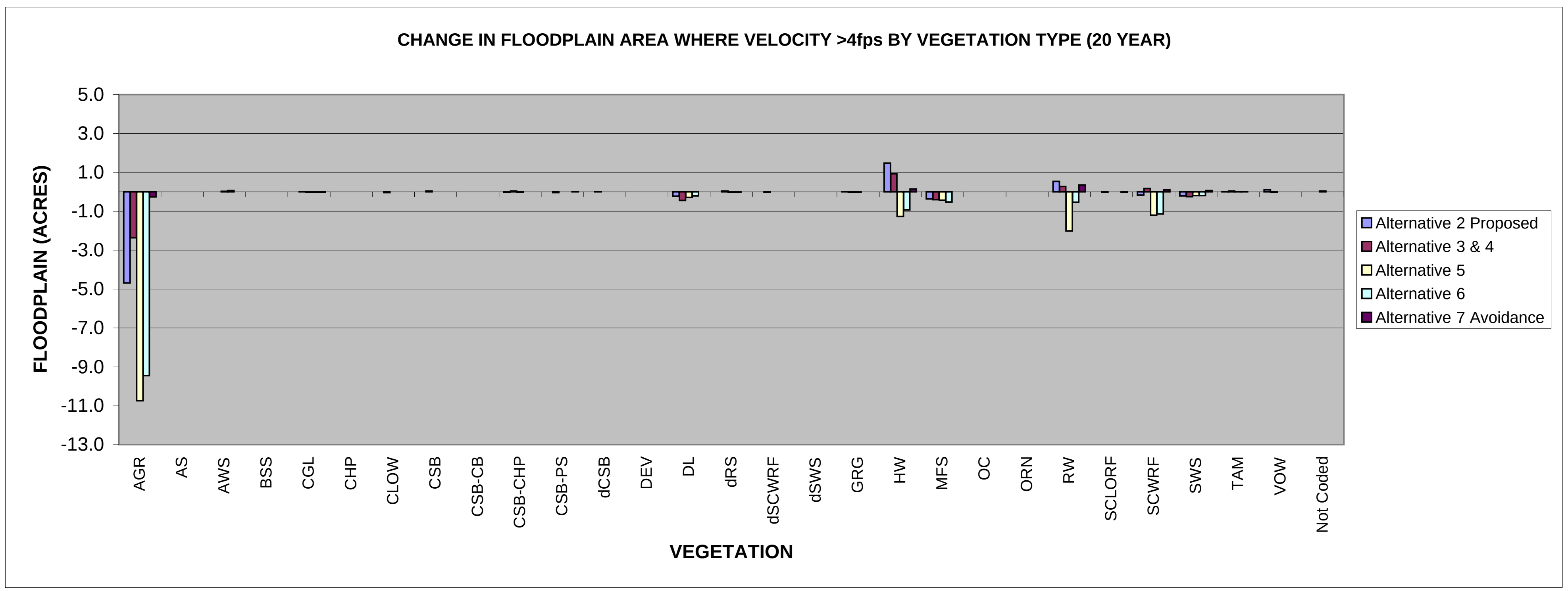
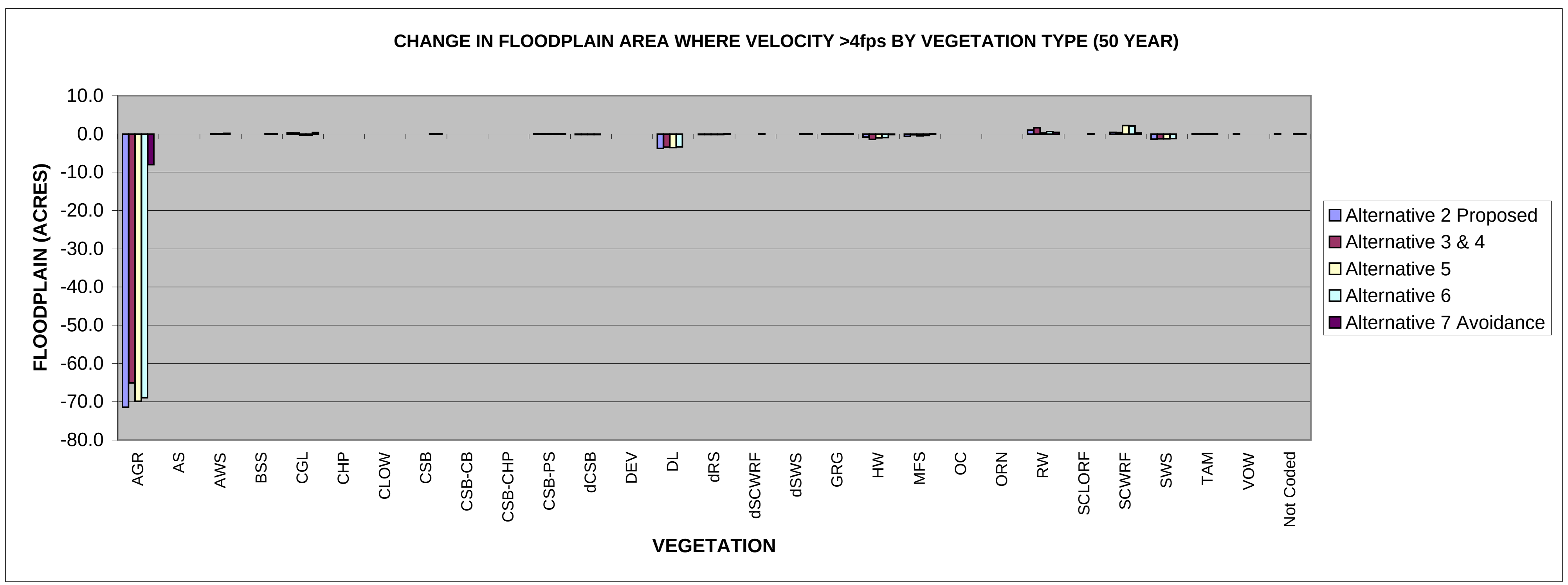


FIGURE 6.1e: CHANGE IN FLOODPLAIN AREA WHERE VELOCITY > 4fps BY VEGETATION, 50-YEAR

50 YEAR

Vegetation Type	Alternative 1 (Existing)	Alternative 2 (Proposed)	DELTA	DELTA %	Alternative 3&4	DELTA	DELTA %	Alternative 5	DELTA	DELTA %	Alternative 6	DELTA	DELTA %	Alternative 7 (Avoidance)	DELTA	DELTA %
AGR	123.3	51.9	-71.4	-57.9%	58.3	-65.0	-52.7%	53.5	-69.9	-56.7%	54.4	-68.9	-55.9%	115.3	-8.0	-6.5%
AS	0.1	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%
AWS	0.1	0.1	0.0	0.0%	0.2	0.0	0.0%	0.2	0.1	75.2%	0.3	0.2	150.4%	0.1	0.0	0.0%
BSS	0.2	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%
CGL	3.1	3.4	0.3	9.7%	3.3	0.2	6.4%	2.8	-0.3	-9.7%	2.8	-0.3	-9.7%	3.5	0.4	12.9%
CHP	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CLOW	0.2	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%
CSB	0.4	0.4	0.0	0.0%	0.4	0.0	0.0%	0.4	0.0	0.0%	0.4	0.0	0.0%	0.4	0.0	0.0%
CSB-CB	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CSB-CHP	0.1	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%
CSB-PS	0.6	0.6	0.1	17.5%	0.6	0.1	17.5%	0.6	0.1	17.5%	0.6	0.0	0.0%	0.6	0.0	0.0%
dCSB	1.5	1.4	-0.1	-6.5%	1.4	-0.2	-13.0%	1.4	-0.2	-13.0%	1.4	-0.1	-6.5%	1.5	0.0	0.0%
DEV	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
DL	12.2	8.5	-3.7	-30.2%	8.8	-3.4	-27.8%	8.7	-3.5	-28.6%	8.9	-3.3	-27.0%	12.2	0.0	0.0%
dRS	3.8	3.6	-0.1	-2.7%	3.7	-0.1	-2.7%	3.6	-0.1	-2.7%	3.6	-0.2	-5.3%	3.8	0.0	0.0%
dSCWRF	0.7	0.8	0.0	0.0%	0.8	0.0	0.0%	0.8	0.0	0.0%	0.8	0.1	13.4%	0.7	0.0	0.0%
dSWS	0.1	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%
GRG	2.6	2.7	0.1	3.8%	2.7	0.0	0.0%	2.7	0.0	0.0%	2.7	0.1	3.8%	2.7	0.1	3.8%
HW	289.9	289.1	-0.8	-0.3%	288.5	-1.4	-0.5%	288.9	-1.0	-0.3%	288.9	-1.0	-0.3%	289.7	-0.2	-0.1%
MFS	2.7	2.1	-0.6	-22.0%	2.5	-0.2	-7.3%	2.2	-0.5	-18.3%	2.3	-0.4	-14.7%	2.8	0.1	3.7%
OC	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
ORN	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
RW	169.0	170.0	1.0	0.6%	170.6	1.6	0.9%	169.2	0.2	0.1%	169.6	0.6	0.4%	169.4	0.4	0.2%
SCLORF	0.3	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.1	40.0%	0.2	-0.1	-40.0%
SCWRF	104.2	104.7	0.5	0.5%	104.6	0.4	0.4%	106.5	2.2	2.1%	106.3	2.1	2.0%	104.5	0.3	0.3%
SWS	5.1	3.8	-1.3	-25.3%	3.9	-1.3	-25.3%	3.9	-1.3	-25.3%	3.9	-1.2	-23.4%	5.1	0.0	0.0%
TAM	1.2	1.2	0.0	0.0%	1.2	0.0	0.0%	1.2	0.0	0.0%	1.2	0.1	8.7%	1.1	0.0	0.0%
VOW	1.7	1.8	0.1	5.9%	1.7	0.0	0.0%	1.7	0.0	0.0%	1.7	0.0	0.0%	1.7	0.0	0.0%
Not Coded	0.1	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.1	67.1%	0.2	0.1	67.1%
< 4fps	570.8	514.4	-56.4	-9.9%	525.7	-45.1	-7.9%	522.1	-48.7	-8.5%	521.4	-49.4	-8.7%	573.7	2.9	0.5%
TOTAL	1294.2	1161.7	-76.1	-5.9%	1179.7	-69.4	-5.4%	1171.3	-74.2	-5.7%	1172.4	-72.4	-5.6%	1289.9	-7.2	-0.6%

AGR	Agriculture
AS	Alluvial Scrub
AWS	Arrow weed scrub
BSS	Big Sagebrush Scrub
CGL	California Annual Grassland
CHP	Undifferentiated Chaparral
CLOW	Coast Live Oak Woodland
CSB	California Sagebrush Scrub
CSB-CB	California Sagebrush Scrub - California Buckwheat
CSB-CHP	California Sagebrush Scrub/Undifferentiated Chapparal
CSB-PS	California Sagebrush Scrub - Purple Sage
dCSB	Disturbed California Sagebruch Scrub
DEV	Developed
DL	Disturbed Land
dRS	Disturbed Riparian Scrub
dSCWRF	Disturbed Southern Cottonwood-Willow Riparian Forest
dSWS	Disturbed Southern Willow Scrub
GRG	Giant Reed Grassland
HW	Herbaceous Wetlands
MFS	Mulefat Scrub
OC	Open Channel
ORN	Ornamental
RW	River Wash
SCLORF	Southern Coast Live Oak Riparian Forest
SCWRF	Southern Cottonwood/Willow Riparian Forest
SWS	Southern Willow Scrub
TAM	Shrub tamarisk
VOW	Valley Oak Woodland



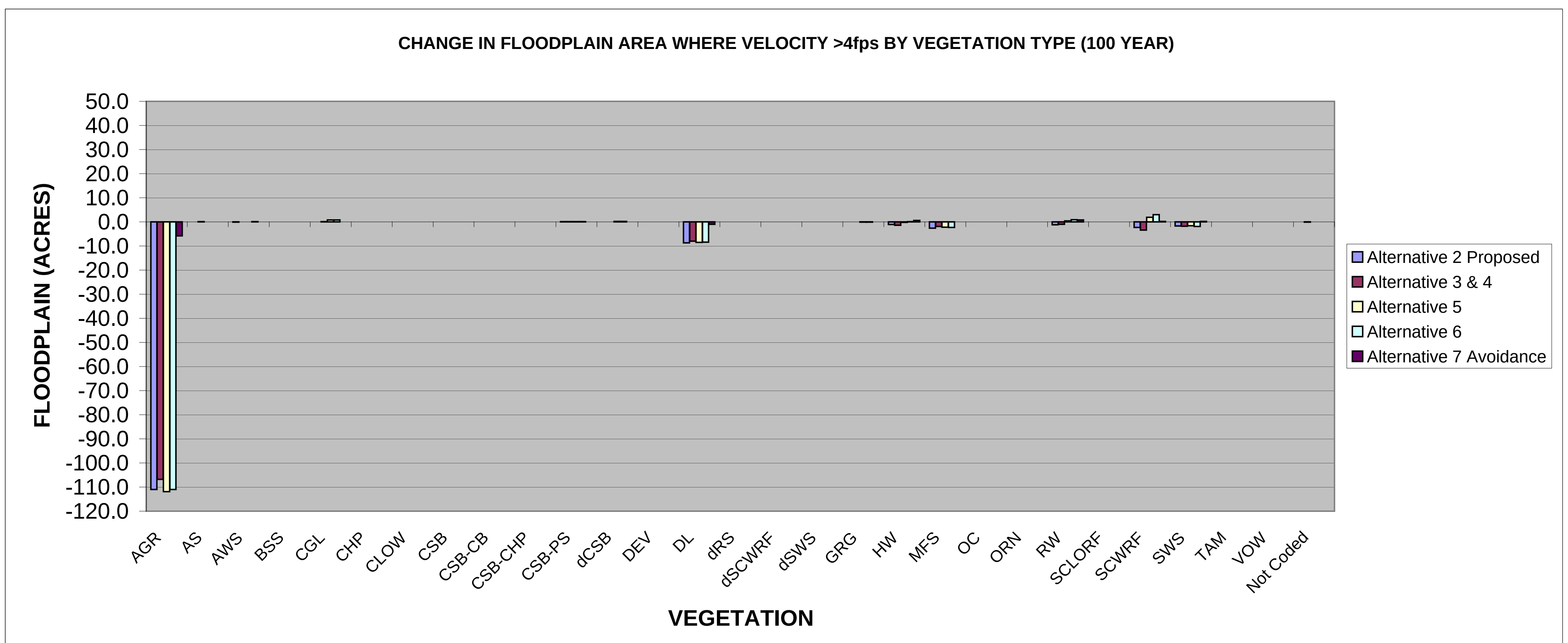
PACE

FIGURE 6.1f: CHANGE IN FLOODPLAIN AREA WHERE VEOLICTY > 4fps BY VEGETATION, 100-YEAR

100 YEAR

Vegetation Type	Alternative 1 (Existing)	Alternative 2 (Proposed)	DELTA	DELTA %	Alternative 3&4	DELTA	DELTA %	Alternative 5	DELTA	DELTA %	Alternative 6	DELTA	DELTA %	Alternative 7 (Avoidance)	DELTA	DELTA %
AGR	193.9	82.9	-111.0	-57.2%	87.1	-106.8	-55.1%	82.0	-111.9	-57.7%	82.9	-111.0	-57.2%	188.1	-5.8	-3.0%
AS	0.3	0.3	0.0	0.0%	0.4	0.1	31.3%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%
AWS	0.3	0.2	-0.1	-32.3%	0.3	0.0	0.0%	0.4	0.1	32.3%	0.4	0.1	32.3%	0.3	0.0	0.0%
BSS	0.2	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%
CGL	4.0	4.0	0.0	0.0%	4.1	0.1	2.5%	4.9	0.8	19.8%	4.9	0.8	19.8%	4.0	0.0	0.0%
CHP	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CLOW	0.3	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%
CSB	0.6	0.6	0.0	0.0%	0.6	0.0	0.0%	0.6	0.0	0.0%	0.6	0.0	0.0%	0.6	0.0	0.0%
CSB-CB	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CSB-CHP	0.1	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%
CSB-PS	0.8	0.9	0.1	12.0%	0.9	0.1	12.0%	0.9	0.1	12.0%	0.9	0.1	12.0%	0.8	0.0	0.0%
dCSB	1.4	1.4	0.0	0.0%	1.4	0.0	0.0%	1.6	0.2	14.3%	1.6	0.2	14.3%	1.4	0.0	0.0%
DEV	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
DL	20.8	12.1	-8.7	-41.8%	12.8	-8.0	-38.4%	12.3	-8.5	-40.8%	12.4	-8.4	-40.3%	19.8	-1.0	-4.8%
dRS	4.9	4.9	0.0	0.0%	4.9	0.0	0.0%	4.9	0.0	0.0%	4.9	0.0	0.0%	4.9	0.0	0.0%
dSCWRF	1.1	1.1	0.0	0.0%	1.1	0.0	0.0%	1.1	0.0	0.0%	1.1	0.0	0.0%	1.1	0.0	0.0%
dSWS	0.3	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%
GRG	3.1	3.1	0.0	0.0%	3.1	0.0	0.0%	3.0	-0.1	-3.2%	3.0	-0.1	-3.2%	3.1	0.0	0.0%
HW	305.8	304.7	-1.1	-0.4%	304.4	-1.4	-0.5%	305.6	-0.2	-0.1%	305.9	0.1	0.0%	306.4	0.6	0.2%
MFS	5.5	2.9	-2.6	-47.7%	3.6	-1.9	-34.9%	3.3	-2.2	-40.4%	3.2	-2.3	-42.2%	5.5	0.0	0.0%
OC	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
ORN	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
RW	194.5	193.3	-1.2	-0.6%	193.5	-1.0	-0.5%	195.0	0.4	0.2%	195.4	0.9	0.5%	195.3	0.8	0.4%
SCLORF	0.3	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%
SCWRF	147.4	145.1	-2.3	-1.6%	144.0	-3.4	-2.3%	149.3	1.9	1.3%	150.4	3.0	2.0%	147.6	0.2	0.1%
SWS	6.5	4.8	-1.7	-26.3%	4.7	-1.8	-27.8%	4.9	-1.6	-24.7%	4.6	-1.9	-29.4%	6.7	0.2	3.1%
TAM	1.2	1.2	0.0	0.0%	1.2	0.0	0.0%	1.2	0.0	0.0%	1.2	0.0	0.0%	1.2	0.0	0.0%
VOW	1.9	1.9	0.0	0.0%	1.9	0.0	0.0%	1.9	0.0	0.0%	1.9	0.0	0.0%	1.9	0.0	0.0%
Not Coded	1.3	1.3	0.0	0.0%	1.2	-0.1	-7.8%	1.3	0.0	0.0%	1.3	0.0	0.0%	1.3	0.0	0.0%
< 4fps	511.2	515.9	4.7	0.9%	525.6	14.4	2.8%	475.4	-35.8	-7.0%	487.3	-23.9	-4.7%	510.7	-0.5	-0.1%
TOTAL	896.4	767.9	-128.5	-14.3%	772.4	-124.0	-13.8%	775.5	-121.0	-13.5%	778.0	-118.5	-13.2%	891.5	-4.9	-0.5%

AGR	Agriculture
AS	Alluvial Scrub
AWS	Arrow weed scrub
BSS	Big Sagebrush Scrub
CGL	California Annual Grassland
CHP	Undifferentiated Chaparral
CLOW	Coast Live Oak Woodland
CSB	California Sagebrush Scrub
CSB-CB	California Sagebrush Scrub - California Buckwheat
CSB-CHP	California Sagebrush Scrub/Undifferentiated Chapparal
CSB-PS	California Sagebrush Scrub - Purple Sage
dCSB	Disturbed California Sagebruch Scrub
DEV	Developed
DL	Disturbed Land
dRS	Disturbed Riparian Scrub
dSCWRF	Disturbed Southern Cottonwood-Willow Riparian Forest
dSWS	Disturbed Southern Willow Scrub
GRG	Giant Reed Grassland
HW	Herbaceous Wetlands
MFS	Mulefat Scrub
OC	Open Channel
ORN	Ornamental
RW	River Wash
SCLORF	Southern Coast Live Oak Riparian Forest
SCWRF	Southern Cottonwood/Willow Riparian Forest
SWS	Southern Willow Scrub
TAM	Shrub tamarisk
VOW	Valley Oak Woodland

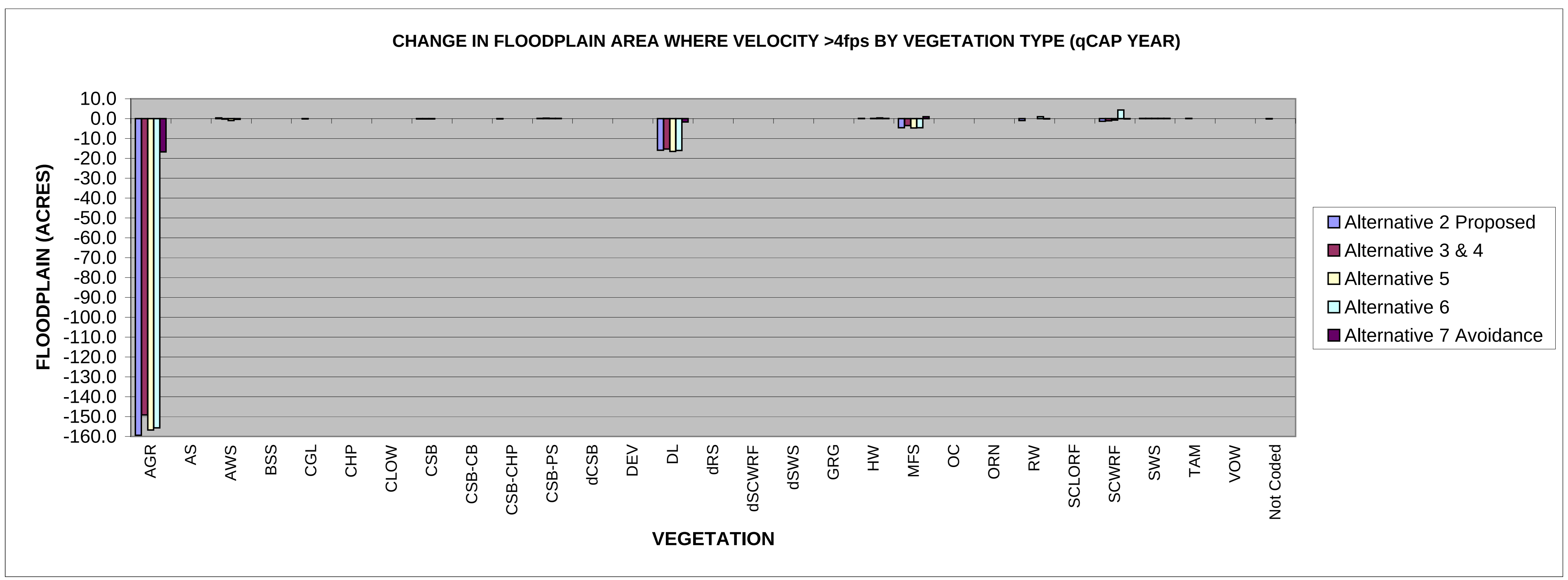


PACE

FIGURE 6.1g: CHANGE IN FLOODPLAIN AREA WHERE VELOCITY > 4fps BY VEGETATION, QCAP

qCAP YEAR

Vegetation Type	Alternative 1 (Existing)	Alternative 2 (Proposed)	DELTA	DELTA %	Alternative 3&4	DELTA	DELTA %	Alternative 5	DELTA	DELTA %	Alternative 6	DELTA	DELTA %	Alternative 7 (Avoidance)	DELTA	DELTA %
AGR	309.4	150.0	-159.4	-51.5%	160.2	-149.2	-48.2%	152.7	-156.7	-50.6%	153.7	-155.7	-50.3%	292.7	-16.7	-5.4%
AS	0.5	0.5	0.0	0.0%	0.5	0.0	0.0%	0.5	0.0	0.0%	0.5	0.0	0.0%	0.5	0.0	0.0%
AWS	2.2	2.6	0.4	18.2%	2.0	-0.2	-9.1%	1.3	-0.9	-40.9%	1.8	-0.4	-18.2%	2.2	0.0	0.0%
BSS	0.3	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%
CGL	13.6	13.5	-0.1	-0.7%	13.5	-0.1	-0.7%	13.6	0.0	0.0%	13.5	-0.1	-0.7%	13.6	0.0	0.0%
CHP	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CLOW	0.8	0.8	0.0	0.0%	0.8	0.0	0.0%	0.8	0.0	0.0%	0.8	0.0	0.0%	0.8	0.0	0.0%
CSB	1.2	1.1	-0.1	-8.3%	1.1	-0.1	-8.3%	1.1	-0.1	-8.3%	1.2	0.0	0.0%	1.2	0.0	0.0%
CSB-CB	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CSB-CHP	0.3	0.2	-0.1	-33.3%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%
CSB-PS	1.5	1.6	0.1	6.7%	1.7	0.2	13.3%	1.6	0.1	6.7%	1.6	0.1	6.7%	1.5	0.0	0.0%
dCSB	2.2	2.2	0.0	0.0%	2.2	0.0	0.0%	2.2	-0.1	-4.5%	2.2	0.0	0.0%	2.2	-0.1	-4.5%
DEV	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
DL	42.3	26.4	-15.9	-37.6%	27.0	-15.3	-36.2%	25.8	-16.5	-39.0%	26.3	-16.0	-37.8%	40.6	-1.7	-4.0%
dRS	5.8	5.8	0.0	0.0%	5.8	0.0	0.0%	5.8	0.0	0.0%	5.8	0.0	0.0%	5.8	0.0	0.0%
dSCWRF	1.6	1.6	-0.1	-6.3%	1.6	0.0	0.0%	1.6	-0.1	-6.3%	1.6	0.0	0.0%	1.6	-0.1	-6.3%
dSWS	0.3	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%
GRG	5.5	5.5	0.0	0.0%	5.5	0.0	0.0%	5.5	0.0	0.0%	5.5	0.0	0.0%	5.5	0.0	0.0%
HW	335.0	335.2	0.2	0.1%	335.0	0.0	0.0%	335.1	0.1	0.0%	335.3	0.3	0.1%	335.2	0.2	0.1%
MFS	12.8	8.2	-4.6	-35.9%	9.3	-3.5	-27.3%	8.1	-4.7	-36.7%	8.2	-4.6	-35.9%	13.8	1.0	7.8%
OC	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
ORN	0.1	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%
RW	224.2	223.2	-1.0	-0.4%	224.2	0.0	0.0%	224.3	0.1	0.0%	225.1	0.9	0.4%	224.0	-0.2	-0.1%
SCLORF	0.3	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%
SCWRF	295.7	294.4	-1.3	-0.4%	294.6	-1.1	-0.4%	295.0	-0.7	-0.2%	300.0	4.3	1.5%	295.6	-0.1	0.0%
SWS	9.5	9.7	0.2	2.1%	9.6	0.1	1.1%	9.7	0.2	2.1%	9.7	0.2	2.1%	9.6	0.1	1.1%
TAM	1.1	1.1	0.0	0.0%	1.2	0.1	9.1%	1.1	0.0	0.0%	1.1	0.0	0.0%	1.1	0.0	0.0%
VOW	2.2	2.2	0.0	0.0%	2.2	0.0	0.0%	2.2	0.0	0.0%	2.2	0.0	0.0%	2.2	0.0	0.0%
Not Coded	2.8	2.8	0.0	0.0%	2.7	-0.1	-3.6%	2.7	-0.1	-3.6%	2.7	-0.1	-3.6%	2.8	0.0	0.0%
< 4fps	403.8	358.0	-45.8	-11.3%	375.5	-28.3	-7.0%	359.2	-44.6	-11.0%	352.0	-51.8	-12.8%	390.2	-13.6	-3.4%
TOTAL	1675.0	1447.7	-181.5	-10.8%	1477.5	-169.2	-10.1%	1451.1	-179.3	-10.7%	1452.4	-170.8	-10.2%	1644.0	-17.4	-1.0%



PACE

FIGURE 6.2a: CHANGE IN FLOODPLAIN AREA WHERE VELOCITY > 4fps BY VEGETATION, 2-YEAR

2 YEAR

Vegetation Type	Alternative 1 (Existing)	Alternative 2 (Proposed)	DELTA	DELTA %	Alternative 3&4	DELTA	DELTA %	Alternative 5	DELTA	DELTA %	Alternative 6	DELTA	DELTA %	Alternative 7 (Avoidance)	DELTA	DELTA %
AGR	1.0	0.9	-0.1	-10.5%	0.9	-0.1	-10.5%	0.8	-0.2	-20.9%	0.9	-0.1	-10.5%	0.9	-0.1	-10.5%
AS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
AWS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
BSS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CGL	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CHP	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CLOW	0.2	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%
CSB	0.6	0.6	0.0	0.0%	0.6	0.0	0.0%	0.6	0.0	0.0%	0.6	0.0	0.0%	0.6	0.0	0.0%
CSB-CB	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CSB-CHP	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CSB-PS	0.4	0.4	0.0	0.0%	0.4	0.0	0.0%	0.4	0.0	0.0%	0.4	0.0	0.0%	0.4	0.0	0.0%
dCSB	1.6	1.5	-0.1	-6.3%	1.6	0.0	0.0%	1.6	0.0	0.0%	1.6	0.0	0.0%	1.6	0.0	0.0%
DEV	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
DL	2.4	2.4	0.0	0.0%	2.4	0.0	0.0%	2.5	0.1	4.1%	2.5	0.1	4.1%	2.4	0.0	0.0%
dRS	1.4	1.5	0.1	7.2%	1.4	0.0	0.0%	1.4	0.0	0.0%	1.4	0.0	0.0%	1.4	0.0	0.0%
dSCWRF	0.4	0.4	0.0	0.0%	0.4	0.0	0.0%	0.4	0.0	0.0%	0.4	0.0	0.0%	0.4	0.0	0.0%
dSWS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
GRG	2.0	2.0	0.0	0.0%	2.0	0.0	0.0%	2.0	0.0	0.0%	2.0	0.0	0.0%	2.0	0.0	0.0%
HW	212.0	211.7	-0.3	-0.1%	211.5	-0.5	-0.2%	211.7	-0.3	-0.1%	211.7	-0.3	-0.1%	211.7	-0.3	-0.1%
MFS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
OC	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
ORN	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
RW	142.5	143.0	0.4	0.3%	142.7	0.2	0.1%	142.9	0.4	0.3%	142.8	0.3	0.2%	142.7	0.2	0.1%
SCLORF	0.2	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%
SCWRF	77.3	77.7	0.4	0.5%	77.1	-0.2	-0.3%	77.5	0.2	0.3%	77.4	0.1	0.1%	77.5	0.3	0.4%
SWS	2.5	2.4	-0.1	-4.0%	2.5	0.0	0.0%	2.5	0.0	0.0%	2.5	0.0	0.0%	2.5	0.0	0.0%
TAM	1.4	1.5	0.0	0.0%	1.4	0.0	0.0%	1.4	0.0	0.0%	1.4	0.0	0.0%	1.5	0.0	0.0%
VOW	1.4	1.3	-0.1	-7.4%	1.4	0.0	0.0%	1.4	0.0	0.0%	1.4	0.0	0.0%	1.4	0.0	0.0%
Not Coded	0.3	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%
TOTAL	447.3	447.5	0.2	0.0%	446.7	-0.6	-0.1%	447.5	0.2	0.0%	447.4	0.1	0.0%	447.4	0.0	0.0%

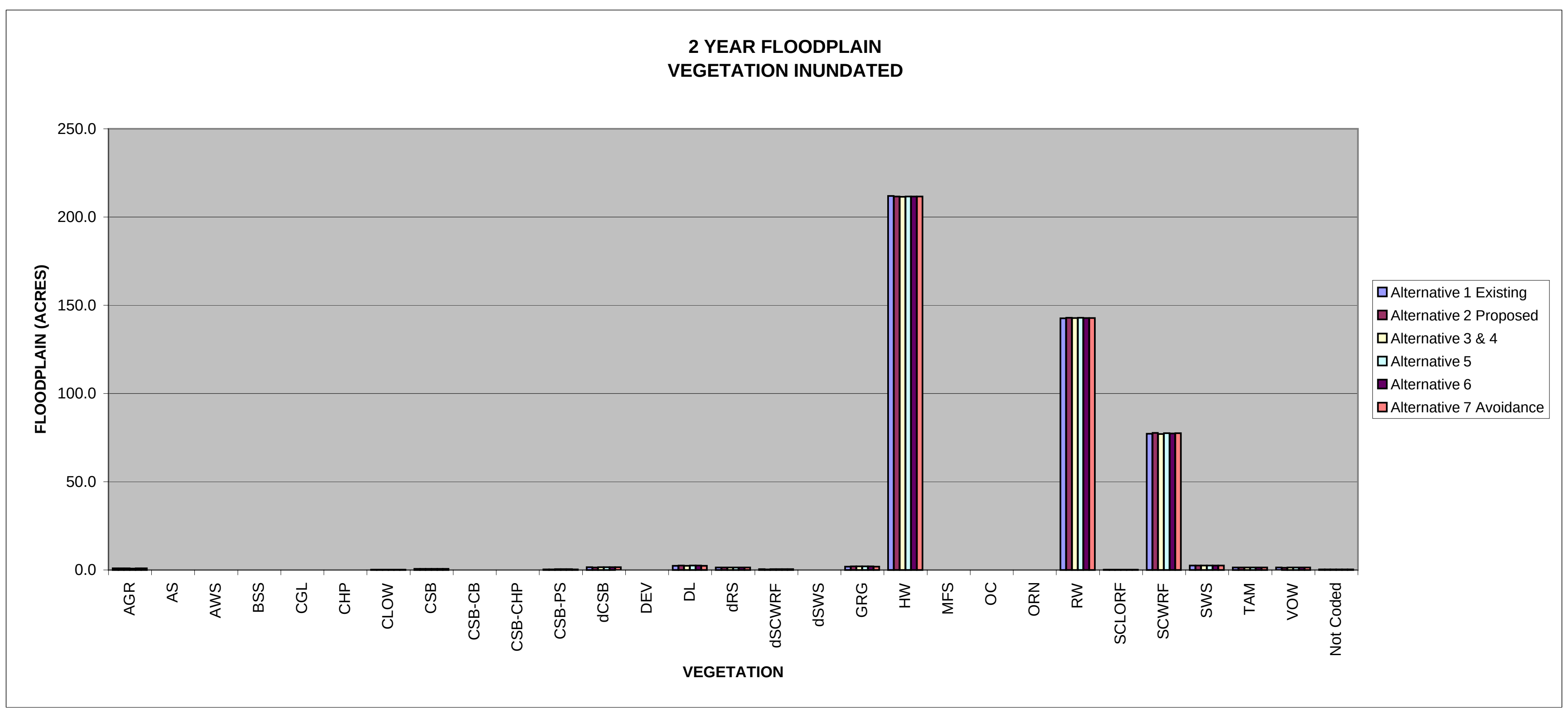


FIGURE 6.2b: CHANGE IN FLOODPLAIN AREA WHERE VELOCITY > 4fps BY VEGETATION, 5-YEAR

5 YEAR

Vegetation Type	Alternative 1 (Existing)	Alternative 2 (Proposed)	DELTA	DELTA %	Alternative 3&4	DELTA	DELTA %	Alternative 5	DELTA	DELTA %	Alternative 6	DELTA	DELTA %	Alternative 7 (Avoidance)	DELTA	DELTA %
AGR	1.4	1.5	0.1	7.4%	1.3	-0.1	-7.4%	1.2	-0.2	-14.8%	1.3	-0.1	-7.4%	1.2	-0.2	-14.8%
AS	0.1	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%
AWS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
BSS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CGL	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CHP	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CLOW	0.3	0.3	-0.1	-30.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%
CSB	0.8	0.7	0.0	0.0%	0.8	0.0	0.0%	0.8	0.0	0.0%	0.8	0.0	0.0%	0.8	0.0	0.0%
CSB-CB	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CSB-CHP	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CSB-PS	0.5	0.5	0.0	0.0%	0.5	0.0	0.0%	0.5	0.0	0.0%	0.5	0.0	0.0%	0.5	0.0	0.0%
dCSB	1.8	1.7	-0.1	-5.7%	1.8	0.0	0.0%	1.8	0.0	0.0%	1.8	0.0	0.0%	1.8	0.0	0.0%
DEV	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
DL	3.8	3.9	0.1	2.6%	3.8	0.0	0.0%	3.8	0.0	0.0%	3.8	0.0	0.0%	3.8	0.0	0.0%
dRS	2.9	2.9	0.0	0.0%	2.9	0.0	0.0%	2.9	0.0	0.0%	2.9	0.0	0.0%	2.9	0.0	0.0%
dSCWRF	0.5	0.5	0.0	0.0%	0.5	0.0	0.0%	0.5	0.0	0.0%	0.5	0.0	0.0%	0.5	0.0	0.0%
dSWS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
GRG	2.5	2.5	0.0	0.0%	2.5	0.0	0.0%	2.5	0.0	0.0%	2.5	0.0	0.0%	2.5	0.0	0.0%
HW	271.8	272.3	0.5	0.2%	272.1	0.2	0.1%	272.0	0.2	0.1%	272.2	0.3	0.1%	272.1	0.3	0.1%
MFS	0.2	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%
OC	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
ORN	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
RW	179.7	179.8	0.1	0.1%	179.8	0.1	0.1%	179.6	0.0	0.0%	180.0	0.4	0.2%	179.9	0.2	0.1%
SCLORF	0.2	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%
SCWRF	120.4	121.1	0.7	0.6%	120.9	0.4	0.3%	120.6	0.2	0.2%	121.2	0.8	0.7%	120.9	0.5	0.4%
SWS	7.6	7.4	-0.3	-3.9%	7.5	-0.1	-1.3%	7.5	-0.1	-1.3%	7.5	-0.1	-1.3%	7.7	0.1	1.3%
TAM	1.7	1.6	0.0	0.0%	1.6	0.0	0.0%	1.6	0.0	0.0%	1.6	0.0	0.0%	1.7	0.0	0.0%
VOW	1.8	1.8	0.0	0.0%	1.8	0.0	0.0%	1.8	0.0	0.0%	1.8	0.0	0.0%	1.8	0.0	0.0%
Not Coded	0.5	0.5	0.0	0.0%	0.5	0.0	0.0%	0.5	0.0	0.0%	0.5	0.0	0.0%	0.5	0.0	0.0%
TOTAL	598.4	599.5	1.1	0.2%	599.0	0.6	0.1%	598.3	0.0	0.0%	599.6	1.3	0.2%	599.4	1.0	0.2%

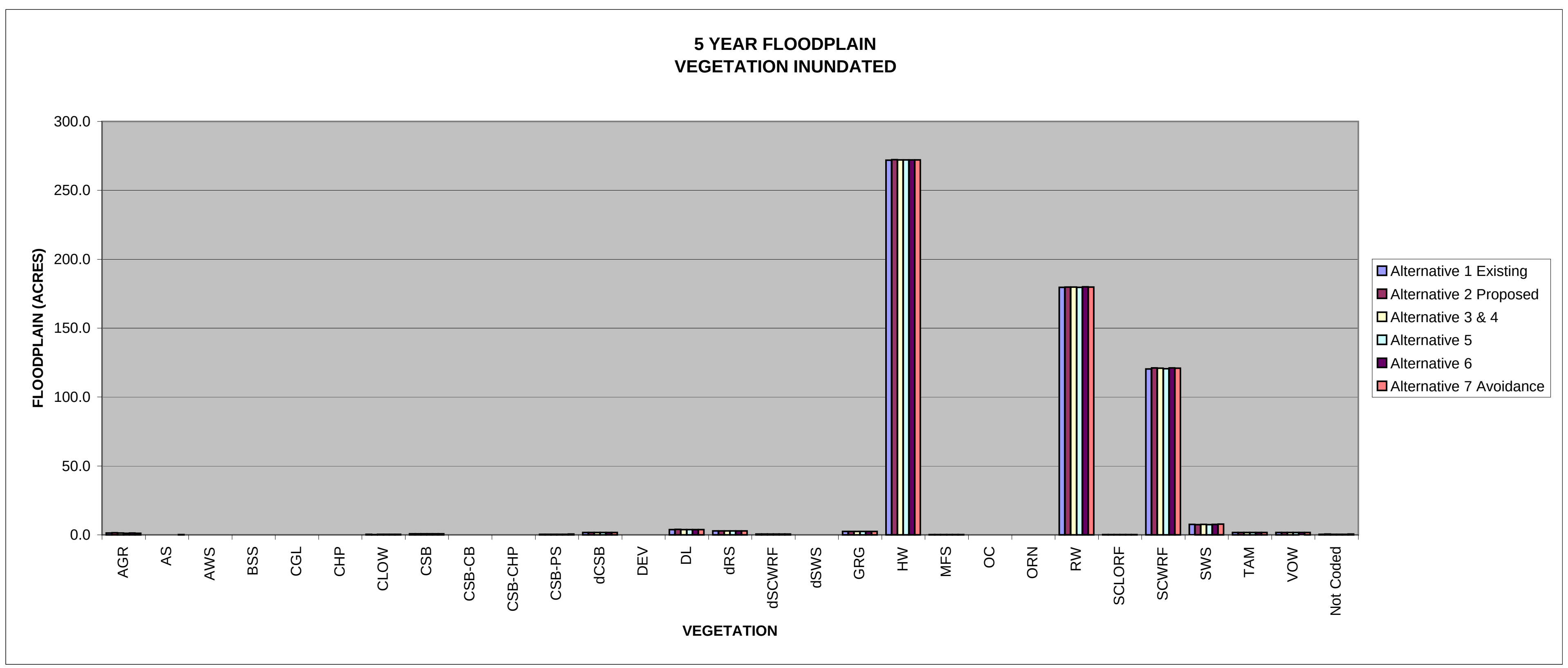


FIGURE 6.2c: CHANGE IN FLOODPLAIN AREA WHERE VELOCITY > 4fps BY VEGETATION, 10-YEAR

10 YEAR

Vegetation Type	Alternative 1 (Existing)	Alternative 2 (Proposed)	DELTA	DELTA %	Alternative 3&4	DELTA	DELTA %	Alternative 5	DELTA	DELTA %	Alternative 6	DELTA	DELTA %	Alternative 7 (Avoidance)	DELTA	DELTA %
AGR	6.9	7.2	0.3	4.4%	4.8	-2.1	-30.6%	4.8	-2.1	-30.6%	4.8	-2.1	-30.6%	5.3	-1.6	-23.3%
AS	0.2	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%
AWS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
BSS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CGL	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CHP	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CLOW	0.5	0.4	-0.1	-19.6%	0.5	0.0	0.0%	0.5	0.0	0.0%	0.5	0.0	0.0%	0.5	0.0	0.0%
CSB	1.1	1.0	-0.1	-9.1%	1.0	-0.1	-9.1%	1.0	-0.1	-9.1%	1.1	0.0	0.0%	1.1	0.0	0.0%
CSB-CB	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CSB-CHP	0.1	0.0	0.0	0.0%	0.1	0.0	0.0%	0.0	0.0	0.0%	0.0	-0.1	-200.0%	0.1	0.0	0.0%
CSB-PS	0.6	0.6	-0.1	-15.6%	0.6	0.0	0.0%	0.6	0.0	0.0%	0.6	0.0	0.0%	0.6	0.0	0.0%
dCSB	2.1	2.0	-0.1	-4.7%	2.1	-0.1	-4.7%	2.1	-0.1	-4.7%	2.1	0.0	0.0%	2.1	0.0	0.0%
DEV	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
DL	5.2	5.3	0.1	1.9%	5.1	-0.1	-1.9%	5.1	-0.1	-1.9%	5.1	-0.1	-1.9%	5.2	0.0	0.0%
dRS	5.7	5.7	0.0	0.0%	5.7	0.0	0.0%	5.7	0.0	0.0%	5.7	0.0	0.0%	5.7	0.0	0.0%
dSCWRF	0.9	0.8	-0.1	-11.1%	0.8	-0.1	-11.1%	0.8	-0.1	-11.1%	0.8	-0.1	-11.1%	0.9	0.0	0.0%
dSWS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
GRG	2.5	2.5	0.0	0.0%	2.5	0.0	0.0%	2.5	0.0	0.0%	2.5	0.0	0.0%	2.5	0.0	0.0%
HW	315.1	315.0	-0.2	-0.1%	314.8	-0.4	-0.1%	314.7	-0.4	-0.1%	314.8	-0.3	-0.1%	314.9	-0.2	-0.1%
MFS	0.4	0.4	0.0	0.0%	0.4	0.0	0.0%	0.4	0.0	0.0%	0.4	0.1	28.6%	0.4	0.0	0.0%
OC	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
ORN	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
RW	195.2	194.9	-0.3	-0.2%	194.8	-0.4	-0.2%	194.8	-0.4	-0.2%	194.9	-0.3	-0.2%	195.3	0.1	0.1%
SCLORF	0.3	0.2	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%
SCWRF	170.2	168.4	-1.8	-1.1%	168.7	-1.5	-0.9%	168.1	-2.1	-1.2%	168.6	-1.6	-0.9%	170.3	0.1	0.1%
SWS	8.9	8.4	-0.5	-5.6%	8.7	-0.2	-2.3%	8.7	-0.2	-2.3%	8.7	-0.2	-2.3%	8.8	-0.1	-1.1%
TAM	1.7	1.7	0.0	0.0%	1.7	0.0	0.0%	1.7	0.0	0.0%	1.7	0.0	0.0%	1.7	0.0	0.0%
VOW	2.0	2.0	-0.1	-5.0%	2.0	0.0	0.0%	2.0	0.0	0.0%	2.0	0.0	0.0%	2.0	0.0	0.0%
Not Coded	0.6	0.6	0.0	0.0%	0.6	0.0	0.0%	0.6	0.0	0.0%	0.6	0.0	0.0%	0.5	0.0	0.0%
TOTAL	720.1	717.1	-2.9	-0.4%	715.2	-4.9	-0.7%	714.4	-5.7	-0.8%	715.4	-4.7	-0.7%	718.3	-1.8	-0.2%

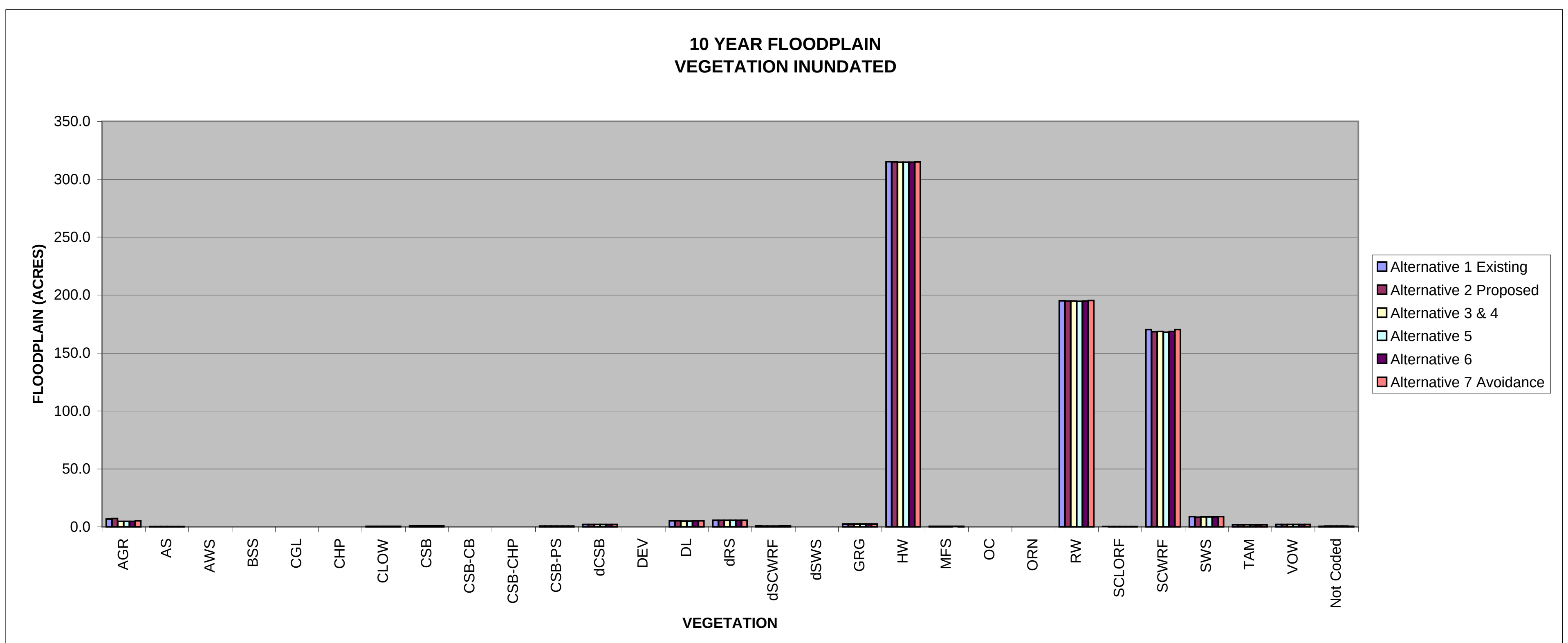


FIGURE 6.2d: CHANGE IN FLOODPLAIN AREA WHERE VELOCITY > 4fps BY VEGETATION, 20-YEAR

20 YEAR

Vegetation Type	Alternative 1 (Existing)	Alternative 2 (Proposed)	DELTA	DELTA %	Alternative 3&4	DELTA	DELTA %	Alternative 5	DELTA	DELTA %	Alternative 6	DELTA	DELTA %	Alternative 7 (Avoidance)	DELTA	DELTA %
AGR	95.1	38.4	-56.7	-59.6%	44.5	-50.6	-53.2%	29.7	-65.4	-68.8%	35.4	-59.7	-62.8%	86.8	-8.3	-8.7%
AS	0.3	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%
AWS	0.6	1.2	0.6	95.2%	0.9	0.2	31.7%	0.4	-0.2	-31.7%	0.4	-0.2	-31.7%	0.6	0.0	0.0%
BSS	0.1	0.2	0.1	100.0%	0.2	0.1	100.0%	0.2	0.1	100.0%	0.0	-0.1	-100.0%	0.1	0.0	0.0%
CGL	2.1	2.1	0.0	0.0%	2.1	0.0	0.0%	2.2	0.1	4.7%	2.2	0.0	0.0%	2.1	0.0	0.0%
CHP	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CLOW	0.9	0.8	-0.1	-11.5%	0.9	0.0	0.0%	0.9	0.0	0.0%	0.9	0.0	0.0%	0.9	0.0	0.0%
CSB	1.4	1.3	-0.1	-7.2%	1.2	-0.2	-14.5%	1.2	-0.2	-14.5%	1.3	-0.1	-7.2%	1.2	-0.1	-7.2%
CSB-CB	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CSB-CHP	0.1	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%
CSB-PS	0.7	0.7	-0.1	-13.9%	0.7	0.0	0.0%	0.7	0.0	0.0%	0.7	0.0	0.0%	0.8	0.0	0.0%
dCSB	2.2	2.2	-0.1	-4.5%	2.2	0.0	0.0%	2.2	0.0	0.0%	2.2	0.0	0.0%	2.3	0.1	4.5%
DEV	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
DL	14.4	8.7	-5.6	-39.0%	8.2	-6.2	-43.1%	8.3	-6.1	-42.4%	8.5	-5.9	-41.1%	12.6	-1.8	-12.5%
dRS	5.8	5.8	0.0	0.0%	5.8	0.0	0.0%	5.8	0.0	0.0%	5.8	0.0	0.0%	5.8	0.0	0.0%
dSCWRF	1.0	1.0	0.0	0.0%	1.0	0.0	0.0%	1.0	0.0	0.0%	1.0	0.0	0.0%	1.1	0.0	0.0%
dSWS	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
GRG	3.5	3.6	0.0	0.0%	3.5	0.0	0.0%	3.5	0.0	0.0%	3.5	0.0	0.0%	3.6	0.0	0.0%
HW	349.4	351.0	1.6	0.5%	349.9	0.5	0.1%	349.5	0.1	0.0%	350.4	1.0	0.3%	349.5	0.1	0.0%
MFS	7.1	3.4	-3.7	-52.0%	4.5	-2.7	-37.9%	2.8	-4.3	-60.4%	3.3	-3.8	-53.4%	7.2	0.0	0.0%
OC	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
ORN	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
RW	220.5	220.8	0.3	0.1%	219.8	-0.7	-0.3%	220.1	-0.3	-0.1%	220.3	-0.1	0.0%	220.5	0.0	0.0%
SCLORF	0.3	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%
SCWRF	279.0	273.0	-6.0	-2.2%	273.8	-5.2	-1.9%	268.4	-10.6	-3.8%	270.7	-8.3	-3.0%	278.3	-0.7	-0.3%
SWS	10.0	9.4	-0.6	-6.0%	9.6	-0.4	-4.0%	9.7	-0.3	-3.0%	9.9	-0.1	-1.0%	10.0	0.0	0.0%
TAM	1.8	1.7	-0.1	-5.6%	1.7	-0.1	-5.6%	1.7	-0.1	-5.6%	1.7	-0.1	-5.6%	1.8	0.0	0.0%
VOW	2.1	2.1	-0.1	-4.7%	2.1	0.0	0.0%	2.1	0.0	0.0%	2.1	0.0	0.0%	2.2	0.0	0.0%
Not Coded	0.6	0.7	0.0	0.0%	0.6	0.0	0.0%	0.7	0.1	15.6%	0.8	0.1	15.6%	0.6	0.0	0.0%
TOTAL	998.9	928.5	-70.4	-7.0%	933.8	-65.1	-6.5%	911.8	-87.1	-8.7%	921.6	-77.4	-7.7%	988.4	-10.5	-1.1%

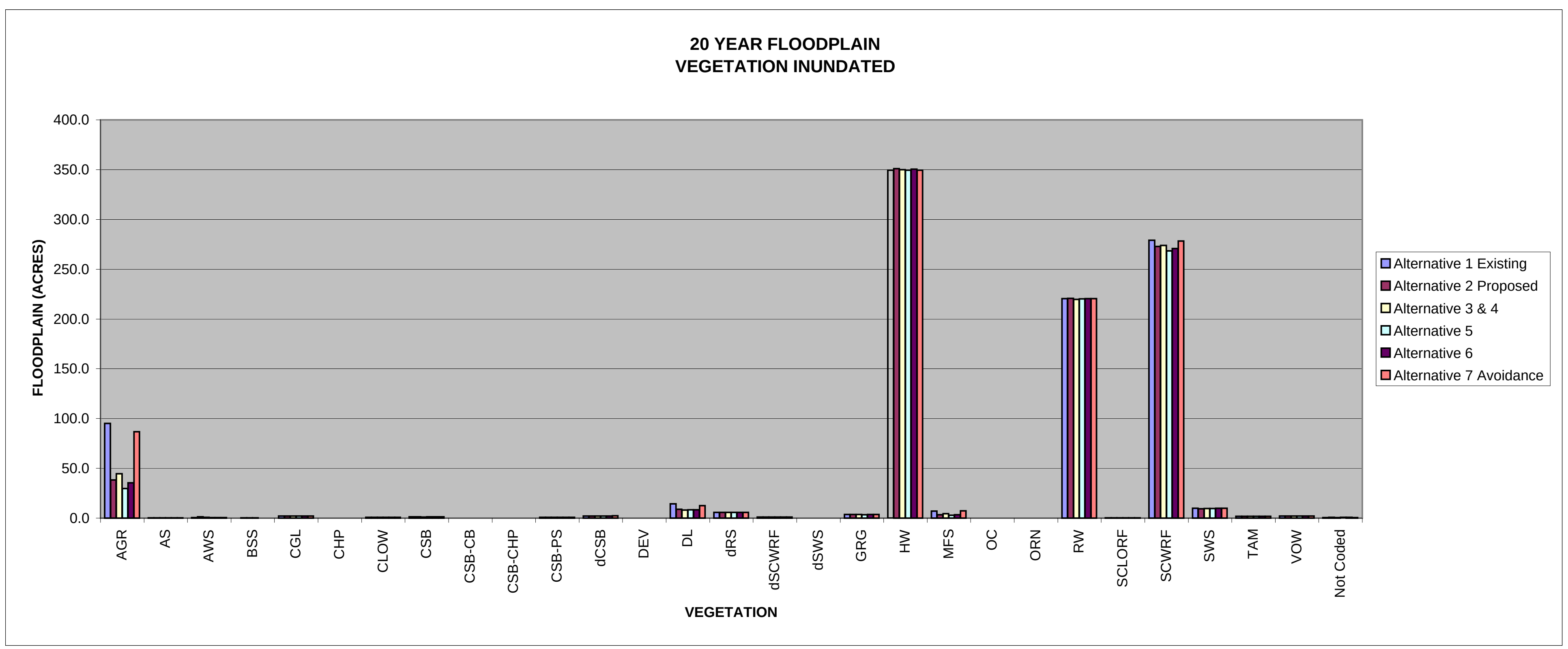


FIGURE 6.2e: CHANGE IN FLOODPLAIN AREA WHERE VELOCITY > 4fps BY VEGETATION, 50-YEAR

50 YEAR																
Vegetation Type	Alternative 1 (Existing)	Alternative 2 (Proposed)	DELTA	DELTA %	Alternative 3&4	DELTA	DELTA %	Alternative 5	DELTA	DELTA %	Alternative 6	DELTA	DELTA %	Alternative 7 (Avoidance)	DELTA	DELTA %
AGR	205.7	89.8	-115.9	-56.4%	97.5	-108.2	-52.6%	94.1	-111.6	-54.3%	94.6	-111.1	-54.0%	202.6	-3.1	-1.5%
AS	0.6	0.7	0.1	16.4%	0.7	0.1	16.4%	0.7	0.1	16.4%	0.7	0.1	16.4%	0.6	0.0	0.0%
AWS	1.9	1.9	0.0	0.0%	1.8	-0.1	-5.3%	0.9	-1.0	-53.5%	0.9	-1.0	-53.5%	1.7	-0.1	-5.3%
BSS	0.3	0.3	0.1	40.0%	0.3	0.1	40.0%	0.3	0.1	40.0%	0.3	0.1	40.0%	0.2	0.0	0.0%
CGL	9.6	9.6	0.0	0.0%	9.7	0.1	1.0%	10.3	0.7	7.3%	10.3	0.7	7.3%	9.7	0.0	0.0%
CHP	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CLOW	1.3	1.2	-0.1	-7.6%	1.3	0.0	0.0%	1.4	0.1	7.6%	1.4	0.1	7.6%	1.2	-0.1	-7.6%
CSB	1.9	1.6	-0.3	-15.7%	1.6	-0.3	-15.7%	1.5	-0.4	-20.9%	1.6	-0.4	-20.9%	1.6	-0.3	-15.7%
CSB-CB	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CSB-CHP	0.1	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.2	0.0	0.0%	0.1	0.0	0.0%
CSB-PS	1.0	1.4	0.4	38.5%	1.5	0.5	48.1%	1.5	0.5	48.1%	1.5	0.5	48.1%	1.1	0.1	9.6%
dCSB	2.5	2.7	0.2	8.0%	2.8	0.3	12.0%	2.8	0.3	12.0%	2.8	0.3	12.0%	2.5	0.0	0.0%
DEV	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
DL	30.0	16.0	-14.0	-46.7%	19.2	-10.8	-36.0%	18.6	-11.4	-38.0%	18.6	-11.4	-38.0%	27.4	-2.6	-8.7%
dRS	5.8	5.8	0.0	0.0%	5.8	0.0	0.0%	5.8	0.0	0.0%	5.8	0.0	0.0%	5.8	0.0	0.0%
dSCWRF	1.3	1.4	0.1	7.6%	1.4	0.1	7.6%	1.4	0.1	7.6%	1.4	0.1	7.6%	1.3	0.0	0.0%
dSWS	0.3	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%
GRG	5.0	5.1	0.1	2.0%	5.0	0.0	0.0%	5.1	0.1	2.0%	5.1	0.0	0.0%	5.0	0.0	0.0%
HW	357.8	358.9	1.1	0.3%	358.6	0.8	0.2%	358.7	0.9	0.3%	358.6	0.8	0.2%	357.8	-0.1	0.0%
MFS	10.5	7.5	-3.0	-28.6%	9.4	-1.1	-10.5%	8.1	-2.4	-22.9%	8.2	-2.3	-21.9%	10.7	0.2	1.9%
OC	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
ORN	0.1	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%
RW	248.1	250.7	2.6	1.0%	249.3	1.2	0.5%	250.5	2.4	1.0%	250.4	2.2	0.9%	248.3	0.2	0.1%
SCLORF	0.3	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%
SCWRF	392.4	389.0	-3.4	-0.9%	395.2	2.8	0.7%	391.0	-1.4	-0.4%	391.6	-0.8	-0.2%	394.2	1.8	0.5%
SWS	11.8	11.5	-0.3	-2.5%	12.0	0.2	1.7%	12.0	0.2	1.7%	12.0	0.2	1.7%	11.8	0.0	0.0%
TAM	1.8	1.8	0.0	0.0%	1.8	0.0	0.0%	1.8	0.0	0.0%	1.8	0.0	0.0%	1.8	0.0	0.0%
VOW	2.4	2.3	-0.1	-4.2%	2.3	-0.1	-4.2%	2.3	-0.1	-4.2%	2.3	-0.1	-4.2%	2.4	0.0	0.0%
Not Coded	1.6	1.8	0.2	12.4%	1.7	0.1	6.2%	1.7	0.1	6.2%	1.7	0.1	6.2%	1.6	0.0	0.0%
TOTAL	1294.2	1161.8	-132.4	-10.2%	1179.7	-114.5	-8.8%	1171.3	-122.9	-9.5%	1172.2	-121.9	-9.4%	1290.0	-4.1	-0.3%

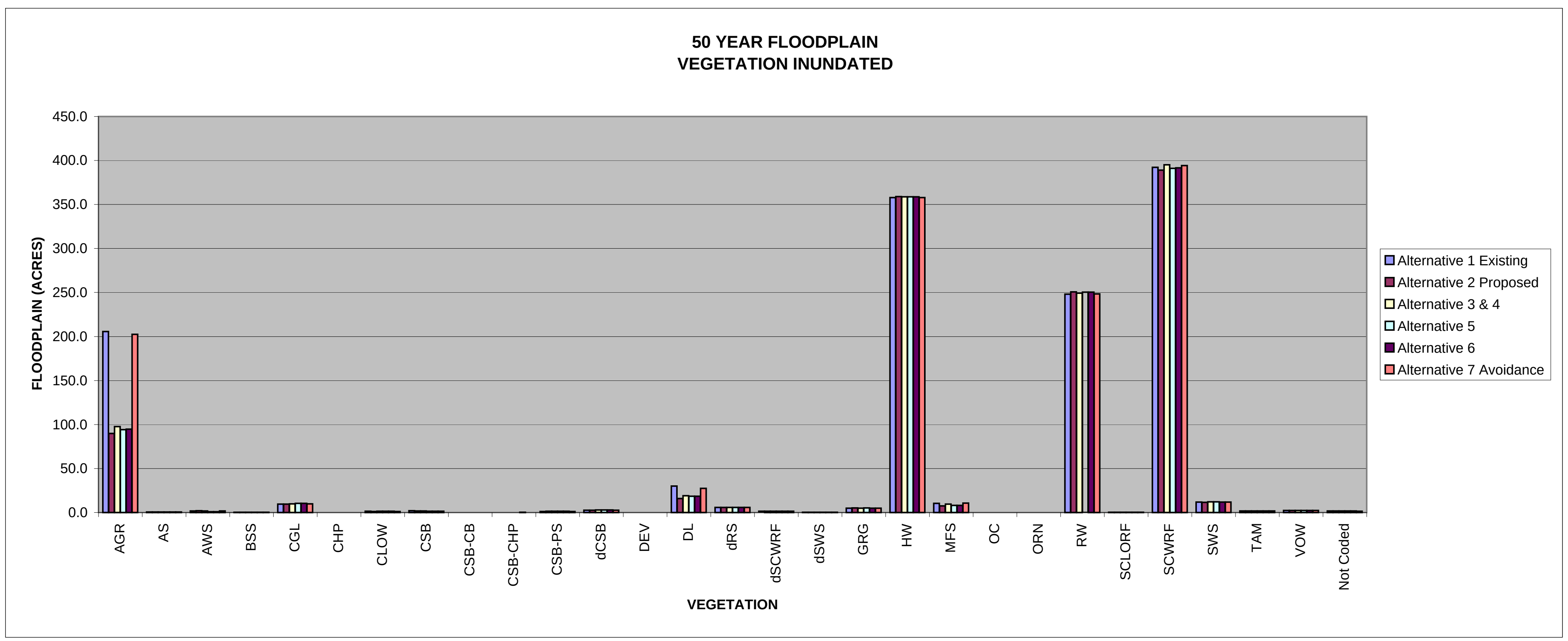


FIGURE 6.2f: CHANGE IN FLOODPLAIN AREA WHERE VELOCITY > 4fps BY VEGETATION, 100-YEAR

100 YEAR

Vegetation Type	Alternative 1 (Existing)	Alternative 2 (Proposed)	DELTA	DELTA %	Alternative 3&4	DELTA	DELTA %	Alternative 5	DELTA	DELTA %	Alternative 6	DELTA	DELTA %	Alternative 7 (Avoidance)	DELTA	DELTA %
AGR	243.3	124.3	-119.0	-48.9%	129.4	-113.9	-46.8%	119.2	-124.1	-51.0%	122.3	-121.0	-49.7%	239.9	-3.4	-1.4%
AS	0.7	1.0	0.3	41.1%	0.9	0.2	27.4%	0.8	0.1	13.7%	0.8	0.0	0.0%	0.8	0.1	13.7%
AWS	2.5	3.0	0.5	20.3%	3.1	0.6	24.4%	1.3	-1.2	-48.8%	2.3	-0.2	-8.1%	2.3	-0.2	-8.1%
BSS	0.4	0.3	-0.1	-25.6%	0.3	-0.1	-25.6%	0.4	0.0	0.0%	0.4	0.0	0.0%	0.4	0.0	0.0%
CGL	15.5	15.3	-0.2	-1.3%	15.5	0.0	0.0%	14.8	-0.7	-4.5%	14.8	-0.7	-4.5%	15.2	-0.3	-1.9%
CHP	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CLOW	1.5	1.4	-0.1	-6.5%	1.5	0.0	0.0%	1.6	0.1	6.5%	1.6	0.1	6.5%	1.4	-0.1	-6.5%
CSB	2.3	1.9	-0.4	-17.2%	2.1	-0.2	-8.6%	1.8	-0.5	-21.6%	1.9	-0.5	-21.6%	1.9	-0.4	-17.2%
CSB-CB	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CSB-CHP	0.2	0.1	-0.1	-50.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%	0.2	0.0	0.0%
CSB-PS	1.4	1.6	0.2	14.0%	1.7	0.3	21.0%	1.8	0.4	28.0%	1.8	0.3	21.0%	1.4	0.0	0.0%
dCSB	2.7	3.0	0.3	11.2%	3.0	0.3	11.2%	3.0	0.3	11.2%	3.1	0.4	14.9%	2.7	0.0	0.0%
DEV	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
DL	39.4	24.7	-14.7	-37.3%	29.2	-10.2	-25.9%	23.1	-16.3	-41.4%	23.1	-16.3	-41.4%	36.8	-2.6	-6.6%
dRS	5.8	5.8	0.0	0.0%	5.8	0.0	0.0%	5.8	0.0	0.0%	5.8	0.0	0.0%	5.8	0.0	0.0%
dSCWRF	1.5	1.5	0.0	0.0%	1.5	0.0	0.0%	1.5	0.0	0.0%	1.5	0.0	0.0%	1.5	0.0	0.0%
dSWS	0.3	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%
GRG	5.4	5.3	-0.1	-1.9%	5.2	-0.2	-3.7%	5.2	-0.2	-3.7%	5.2	-0.1	-1.9%	5.4	0.0	0.0%
HW	359.9	361.4	1.5	0.4%	361.2	1.3	0.4%	360.6	0.8	0.2%	360.7	0.8	0.2%	359.9	0.0	0.0%
MFS	13.4	10.5	-2.9	-21.7%	11.6	-1.8	-13.5%	9.9	-3.5	-26.2%	10.3	-3.1	-23.2%	14.4	1.0	7.5%
OC	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
ORN	0.1	0.1	0.0	0.0%	0.2	0.1	83.3%	0.1	0.0	0.0%	0.1	0.0	0.0%	0.1	0.0	0.0%
RW	255.2	257.4	2.2	0.9%	256.0	0.8	0.3%	254.1	-1.1	-0.4%	254.4	-0.9	-0.4%	255.3	0.1	0.0%
SCLORF	0.3	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%
SCWRF	436.3	444.9	8.6	2.0%	449.2	12.9	3.0%	425.3	-11.0	-2.5%	434.7	-1.6	-0.4%	436.9	0.6	0.1%
SWS	12.4	12.6	0.2	1.6%	12.7	0.3	2.4%	12.5	0.1	0.8%	12.6	0.2	1.6%	12.4	0.0	0.0%
TAM	1.9	1.9	0.0	0.0%	1.9	0.0	0.0%	1.9	0.0	0.0%	1.9	0.0	0.0%	1.9	0.0	0.0%
VOW	2.5	2.5	0.0	0.0%	2.5	0.0	0.0%	2.5	0.0	0.0%	2.5	0.0	0.0%	2.5	0.0	0.0%
Not Coded	2.6	2.8	0.2	7.6%	2.7	0.1	3.8%	2.7	0.1	3.8%	2.7	0.0	0.0%	2.6	0.0	0.0%
TOTAL	1407.6	1283.9	-123.7	-8.8%	1298.0	-109.6	-7.8%	1250.7	-156.9	-11.1%	1265.3	-142.4	-10.1%	1402.3	-5.3	-0.4%

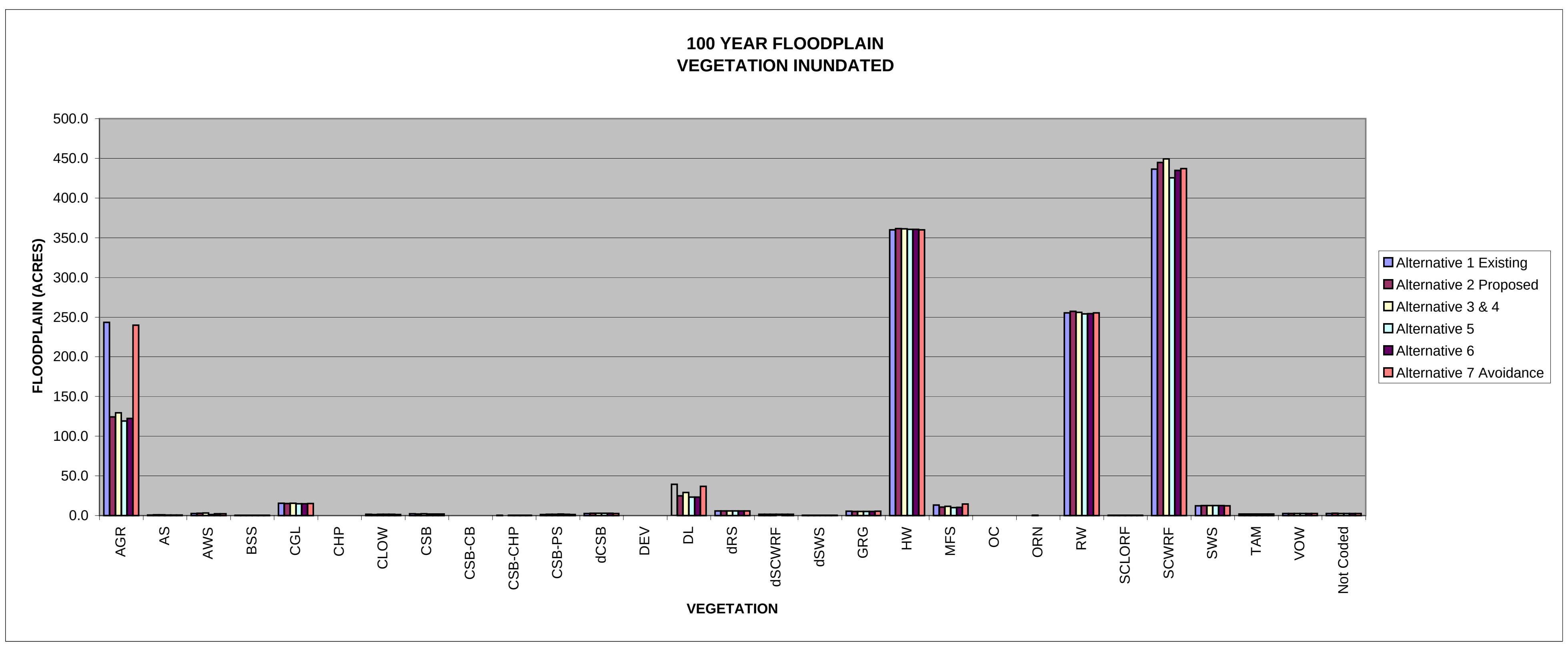
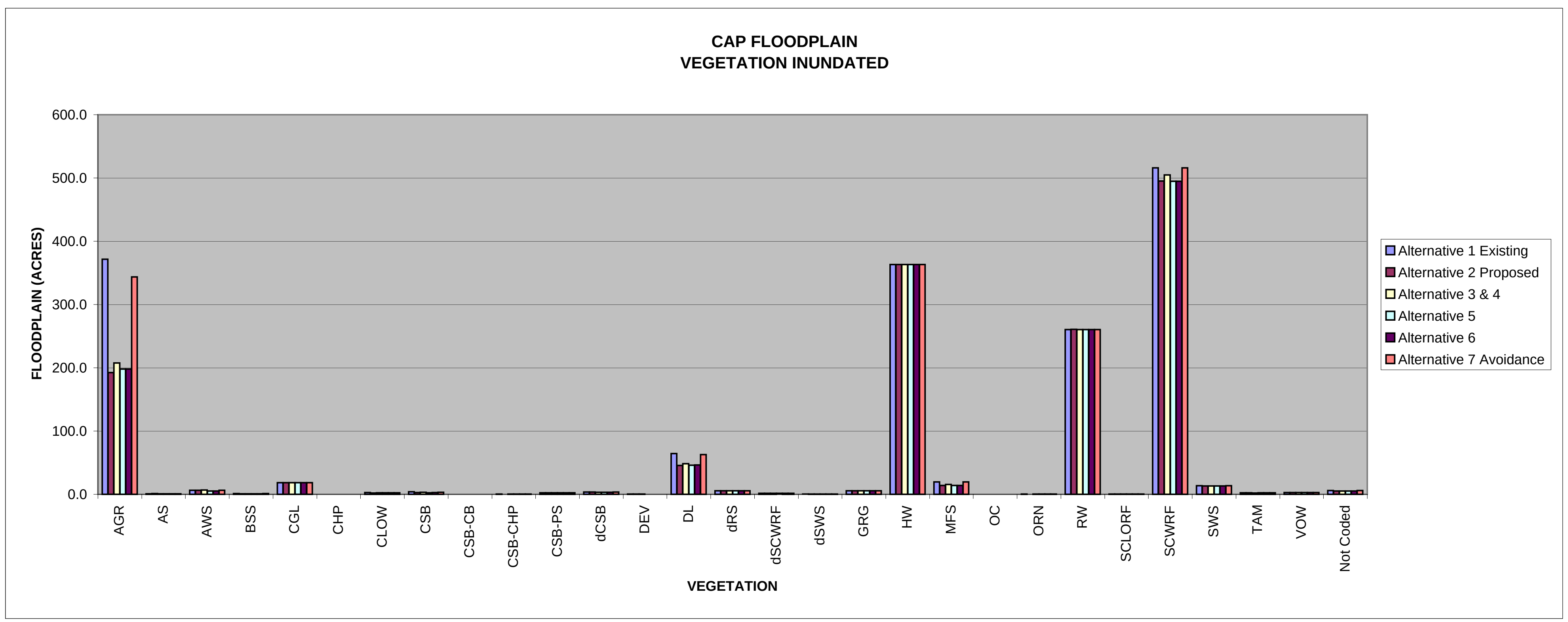


FIGURE 6.2g: CHANGE IN FLOODPLAIN AREA WHERE VELOCITY > 4fps BY VEGETATION, QCAP

QCAP

Vegetation Type	Alternative 1 (Existing)	Alternative 2 (Proposed)	DELTA	DELTA %	Alternative 3&4	DELTA	DELTA %	Alternative 5	DELTA	DELTA %	Alternative 6	DELTA	DELTA %	Alternative 7 (Avoidance)	DELTA	DELTA %
AGR	371.5	192.3	-179.2	-48.2%	207.5	-164.0	-44.1%	197.9	-173.6	-46.7%	198.2	-173.3	-46.6%	343.6	-27.9	-7.5%
AS	1.0	1.4	0.4	40.0%	1.0	0.0	0.0%	1.0	0.0	0.0%	1.0	0.0	0.0%	1.0	0.0	0.0%
AWS	6.5	6.4	-0.1	-1.5%	6.8	0.3	4.6%	5.2	-1.3	-20.0%	5.2	-1.3	-20.0%	6.4	-0.1	-1.5%
BSS	1.2	0.9	-0.3	-25.0%	0.9	-0.3	-25.0%	0.9	-0.3	-25.0%	0.9	-0.3	-25.0%	1.1	-0.1	-8.3%
CGL	18.5	18.6	0.1	0.5%	18.4	-0.1	-0.5%	18.5	0.0	0.0%	18.5	0.0	0.0%	18.6	0.1	0.5%
CHP	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CLOW	2.8	2.1	-0.7	-25.0%	2.5	-0.3	-10.7%	2.6	-0.2	-7.1%	2.6	-0.2	-7.1%	2.5	-0.3	-10.7%
CSB	3.9	2.8	-1.1	-28.2%	3.2	-0.7	-17.9%	2.6	-1.3	-33.3%	2.7	-1.2	-30.8%	3.2	-0.7	-17.9%
CSB-CB	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
CSB-CHP	0.4	0.2	-0.2	-50.0%	0.3	-0.1	-25.0%	0.4	0.0	0.0%	0.4	0.0	0.0%	0.4	0.0	0.0%
CSB-PS	2.5	2.4	-0.1	-4.0%	2.6	0.1	4.0%	2.5	0.0	0.0%	2.5	0.0	0.0%	2.5	0.0	0.0%
dCSB	3.5	3.5	0.0	0.0%	3.4	-0.1	-2.9%	3.4	-0.1	-2.9%	3.4	-0.1	-2.9%	3.5	0.0	0.0%
DEV	0.3	0.3	0.0	0.0%	0.3	0.0	0.0%	0.2	-0.1	-33.3%	0.2	-0.1	-33.3%	0.2	-0.1	-33.3%
DL	64.6	45.7	-18.9	-29.3%	48.5	-16.1	-24.9%	46.2	-18.4	-28.5%	46.4	-18.2	-28.2%	62.8	-1.8	-2.8%
dRS	5.8	5.8	0.0	0.0%	5.8	0.0	0.0%	5.8	0.0	0.0%	5.8	0.0	0.0%	5.8	0.0	0.0%
dSCWRF	1.6	1.6	0.0	0.0%	1.6	0.0	0.0%	1.6	0.0	0.0%	1.6	0.0	0.0%	1.6	0.0	0.0%
dSWS	0.3	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%
GRG	5.6	5.6	0.0	0.0%	5.6	0.0	0.0%	5.6	0.0	0.0%	5.6	0.0	0.0%	5.6	0.0	0.0%
HW	363.4	363.1	-0.3	-0.1%	363.2	-0.2	-0.1%	363.1	-0.3	-0.1%	363.2	-0.2	-0.1%	363.4	0.0	0.0%
MFS	19.8	14.0	-5.8	-29.3%	15.7	-4.1	-20.7%	13.9	-5.9	-29.8%	14.2	-5.6	-28.3%	19.7	-0.1	-0.5%
OC	0.0	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%	0.0	0.0	0.0%
ORN	0.3	0.2	-0.1	-33.3%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%	0.3	0.0	0.0%
RW	260.3	260.9	0.6	0.2%	260.4	0.1	0.0%	260.4	0.1	0.0%	260.6	0.3	0.1%	260.4	0.1	0.0%
SCLORF	0.4	0.4	0.0	0.0%	0.4	0.0	0.0%	0.4	0.0	0.0%	0.4	0.0	0.0%	0.4	0.0	0.0%
SCWRF	516.1	495.4	-20.7	-4.0%	505.0	-11.1	-2.2%	494.7	-21.4	-4.1%	494.9	-21.2	-4.1%	516.0	-0.1	0.0%
SWS	13.5	13.3	-0.2	-1.5%	13.3	-0.2	-1.5%	13.3	-0.2	-1.5%	13.3	-0.2	-1.5%	13.5	0.0	0.0%
TAM	2.3	2.3	0.0	0.0%	2.2	-0.1	-4.3%	2.3	0.0	0.0%	2.3	0.0	0.0%	2.3	0.0	0.0%
VOW	2.9	2.8	-0.1	-3.4%	2.9	0.0	0.0%	2.9	0.0	0.0%	2.9	0.0	0.0%	2.9	0.0	0.0%
Not Coded	6.1	5.3	-0.8	-13.1%	5.2	-0.9	-14.8%	5.1	-1.0	-16.4%	5.2	-0.9	-14.8%	6.0	-0.1	-1.6%
TOTAL	1675.1	1447.6	-227.5	-13.6%	1477.3	-196.9	-11.8%	1451.1	-224.0	-13.4%	1452.6	-222.5	-13.3%	1644.0	-31.1	-1.9%



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